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ABSTRACT

Job and educational opportunities are increasing dramatically. School guidance counselors can no longer cope adequately with the available information, nor can they help all students to see the complex range of alternative life styles. Computers are now programed to give students information. They can also provide for students' decision-making experiences and the chance to study various value systems by playing life-career games. These guidance systems are programed to understand English. If student interaction with the computer is monitored by the counselor, he may detect personal problems and help solve them or quickly refer the student to the school psychiatrist. However, whether computers should have programs with value orientations, whether students and counselors will accept these machines, and whether the machines will in fact better equip the student to make decisions wisely remain matters for discussion and careful study. Even the simplest use of computers for individualized scheduling raises these problems. The document contains summaries of fifteen papers on these issues and a description of ten guidance systems under development. (MM)

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computer-based vocational guidance systems

Summary of Papers Presented at the
Fourth Symposium for Systems under
Development for Vocational Guidance

With a Description of Some Guidance
Systems Under Development

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FOREWORD

Each year the problem of providing adequate vocational guidance for students becomes more complex. The number and variety of jobs has increased dramatically. The volume of information available to help students plan and prepare for careers has become tremendous.

The urgency of the problem has led those most concerned with vocational guidance to explore the application of computer technology to the counseling field. As a result, a number of projects employing the use of computers are helping the student to learn more about himself, to improve his ability to make wise decisions, and to accept responsibility for his own career choices.

Problems and accomplishments related to the development of such computer systems are the subject of this publication. Part I discusses *Theoretical Considerations in Developing Vocational Guidance Systems;* Part II, *Problems of Implementation,* tells about using these systems; and Part III examines some of the vocational guidance systems now under development.

Teachers, counselors, and secondary school administrators in schools where computer facilities are or may soon become available should find this publication useful for their vocational guidance programs. Faculty and administrators in junior and community colleges may learn what career options are open to their students. At the university level, knowledge of computer usage opens a variety of opportunities for business and professional leadership; it can also increase the counseling competence of future educational professionals. Adults also need to know more about computerized information as a basis for planning for their own future and helping their children face tomorrow's world.

James J. Gallagher, Acting Associate Commissioner
Bureau of Research

contents

Foreword III

Introduction—Alice Y. Scates VII

Part I: Theoretical Considerations in Developing Systems for Vocational Guidance

The Need for Improved Vocational Guidance—John C. Flanagan 1

Basic Functions of Guidance and Counseling: Planning Personal Career Development—Donald E. Super 3

Learning To Make Wise Decisions—L. C. Martin Katz 10

Learning About Opportunities for Adult Activities and Roles at the College Level—Paul R. Lohnes 16

Analysis of Student Attitudes and Beliefs About Counseling—Barbara Rosenquist 26

Learning To Manage and Managing Personal Development—G. Brian Jones 33

Resolving Personal Problems and Problem Situations—Robert E. Campbell 40

Evaluating Personal Potentials—A. Carp 46

Ten Basic Questions in Guidance and School Learning—Thomas L. Hilton 51

Part II: Problems of Implementation

Computer Systems for Guidance—William W. Cooley 61

Considerations in the Design of Automated Guidance Systems—William Godwin 72

Getting a Guidance Machine To Understand English—Allan B. Ellis, Margaret E. Pincus, Patricia Yee 77

A Dialog on the Use of Natural Language in the Information System for Vocational Decisions—David V Tiedeman and Robert P. O'Hara 100

Computer Programs in ISVD—Thomas Hutchinson 103

Problems Associated with Simulating a Counselor's Function in the Student Decisionmaking Process—Tommy L. Roberts 109

Implementation Problems: Counselor Acceptance of Systems—Joseph T. Impellitteri 116

Part III: Some Vocational Guidance Systems Under Development

General Overview—Judith Weinstein 123

The Harvard-Needs-Newton Information System for Vocational Decisions 124

The IBM Experimental Educational and Career Exploration System 130

The American Institutes for Research Comprehensive Vocational Guidance System 135

The SDC Vocational Counseling System 139

The Rochester Career Guidance Project 144

The Pennsylvania State University Computer–Assisted Career Exploration System 149

The University of Oregon GUIDPAK System 153

The Willowbrook Computerized Vocational Information System 158

The Palo Alto Computer-Based Course Selection and Counseling System— 162

The Bartlesville Total Guidance Information Support System 167

Introduction

Alice Y. Scates*

The research and development program authorized by the Vocational Education Act of 1963 was set up by the U.S. Office of Education in 1964. The projects proposed for support under that program soon made it clear that the need for better vocational guidance was a primary concern throughout the country. The program, now administered by the Division of Comprehensive and Vocational Education Research, Bureau of Research, has since provided support for numerous projects aimed at improving counseling and guidance, especially for those students who will not earn college degrees. Among the persons working on such projects, there soon appeared a strong interest in developing complete systems of vocational guidance based on the full use of modern technology resources.

A meeting of persons who had already started work on these new systems, held in August 1966, was sponsored by the Center for Vocational and Technical Education which is supported by the U.S. Office of Education and which is located at Ohio State University. Its purpose was to permit an exchange of ideas and information about plans for developing vocational guidance systems. The group decided that is would be helpful to continue this form of communication, and the second meeting took place in March 1967 at the Systems Development Corporation in Santa Monica, Calif.

Although the group has no formal organizational structure nor sponsorship, the meetings have continued. The third symposium was held at the Advanced Systems Development Division, International Business Machines Corporation, in Yorktown Heights, N.Y., in September 1967. The chairman was Dr. Frank Minor. Again, the participants came together to describe their work in planning and developing their various systems and to discuss the problems they were encountering.

At that meeting, it was proposed that the fourth conference have a slightly different structure. The *ad hoc* committee selected to plan and arrange it consisted of William Cooley, Murray Tondow, and John C. Flanagan, chairman. The committee prepared a list of topics which were submitted to members of the group for indications of interest and willingness to prepare papers. On the basis of the replies, 15 papers were prepared covering topics on the basic functions of guidance and the applications of technology in solving guidance problems. The fourth Symposium for Systems under Development for Vocational Guidance was held in March 1968 at the American Institutes for Research in Palo Alto, Calif., with Dr. John C. Flanagan presiding. Dr. Alice Scates, who attended the meeting as a representative of the Office of Education's Bureau of Research, was asked to take responsibility for editing the papers for publication.

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*Head, Basic Studies Branch, Division of Comprehensive and Vocational Research, Bureau of Research, U.S. Office of Education.

Because of the great promise for improvement in vocational guidance represented by these projects, and because of the strong interest which has been expressed in this application of technology, the papers prepared for the fourth Symposium are presented in this publication. They have been divided into two categories: those dealing with the particular concerns of those attempting to develop computer-based vocational guidance systems, and those that focus on technological problems—the difficulties involved in using existing computers for vocational guidance purposes.

The brief descriptions in Part III of some vocational guidance systems currently under development are certainly not all of the projects which could or should be mentioned in a comprehensive survey of the many important efforts in counseling and guidance. But these descriptions do make available for the first time information about a major trend in that area.

PART I

theoretical considerations in developing vocational guidance systems

The Need For Improved Vocational Guidance

John C. Flanagan*

Recent studies have demonstrated conclusively that the problem of providing satisfactory vocational guidance to secondary school students is critical. In a study of the vocational maturity of ninth-grade boys, Super and Overstreet found in 1960 that more than half of them planned to enter occupations that appeared inappropriate in terms of intellectual and educational requirements.[1] A more recent national survey, conducted by Coleman and others in 1965, found that when a group of 12th-grade students were asked to indicate the type of job they expected to have when they finished their education more than half of those responding indicated they expected to occupy professional or managerial positions.[2]

In a survey of a better-than-average school district in one Northeastern State, graduates 1 and 5 years out of high school, when asked the question, "The main thing I believe I needed which was not provided by this school was ——————," indicated that *guidance and counseling* was their most important unfilled need. Since, on a comparative basis, this school has a far better than average guidance program, it can be safely assumed that these results would be duplicated in most other communities in the country.

Direct evidence of the instability of high school students' career planning is provided by the survey and followup studies of Project TALENT.[3] For example, when 10th-grade boys' career plans after they had been out of high school 1 year were compared with these same boys' plans 3 years later, it was found that only 19 percent were still planning the same occupation. For 12th-grade boys who indicated their plans in the spring before graduation and were again queried about a year after graduation, only 31 percent indicated the same occupational role plans. Although the girls' plans were concentrated in only a few of the 30 categories, only 29 percent of those indicating a particular career plan in the 10th-grade and 41 percent indicating a specific plan in the 12th-grade had the same plans one year after high school graduation.

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* Chairman of the Board, American Institutes for Research.

[1] Super, D. E. and Overstreet, Poebe L. *The Vocational Maturity of Ninth-Grade Boys.* New York City, N.Y: Columbia University, 1960. 212 p.

[2] Coleman, James S., and others. *Equality of Educational Opportunity.* U.S. Department of Health, Education, and Welfare, Office of Education, (OE–38001) Washingon, U.S. Government Printing Office, 1966.

[3] Flanagan, John C., *One-Year Follow-up Studies.* University of Pittsburgh, 1966, 346 p.

These studies indicate that the current programs for providing vocational guidance to secondary school students are not nearly as effective as the demands of the present complex society require. Supporting these findings is the report prepared by C. Gilbert Wrenn for the Commission on Guidance in American Schools.[4]

Two of the recommendations of this report, published in 1962 under the title *The Counselor in a Changing World,* are quoted here. The first recommended ". . . that primary emphasis in counseling students be placed on the developmental needs and decision points in the lives of the total range rather than the remedial needs and crisis points in the lives of a few students, with the major goal of counseling being that of increased self-responsibility and an increased maturity in decisionmaking upon the part of the student.[5]

The second recommended that ". . . vocational choice be seen as a process extending over years and not as an event, that the student be helped to make a series of choices as he becomes increasingly realistic about himself and the occupational world, that urging a student to 'make up his mind' in the sense of a final settlement may be considerably more harmful than helpful." [6]

The above recommendations are incorporated in the goals of several vocational guidance systems currently under development. To achieve these goals, the developers are attempting to resolve theoretical questions and, at the same time, to exploit fully the many resources of modern technology. In the process they have identified a variety of problems on which we shall focus our present discussions.

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[4] Wrenn, C. Gilbert. *The counselor in a changing world,* American Personnel and Guidance Association, 1962. 195 p.

[5] Ibid., p. 109.

[6] Ibid., p. 110.

Basic Functions of Guidance and Counseling: Planning Personal Career Development

Donald E. Super*

Planning must first be placed in its proper context by relating it to other functions. Counseling has four basic functions: Analysis, synthesis, planning, and execution.

The first generation of vocational counselors, following Frank Parsons 60 years ago, identified the first three, and then added the fourth in the limited form of placement. The second counselor generation, following Donald Paterson and his students at Minnesota, dealt with the same functions. Although the terms change, the specific categories vary somewhat, and the functions are performed with some new tools and in somewhat different ways, the basic objectives and processes remain the same. We now have a third counselor generation with which all of us identify, even though some had their professional origins in the 1930 generation. In this new generation of the 1960's we are concerned with the same functions, whatever we call them, and whatever the new hardware we mobilize to get our software into use.

The *analysis function* and process has always had two foci, the person and the situation in which he operates. The emphasis has varied with fads and fashions, the impact of innovations in psychology such as the development of psychometric devices and Rogerian psychotherapy, and the counter-impact of economic and social developments such as the Great Depression of the 1930's and the rediscovery of the poor in the 1960's.

The *synthesizing function* has also been differently conceived at different times, for the same reasons. It has been thought of as insight, adjustment, adaptation, integration, acceptance, compromise, and knowledge. There is some advantage in keeping these different conceptions in mind, for a true synthesis of what one has learned about oneself and about the world in which one lives should result in some combination of these. But as one who is to focus on planning, I would like to point out a curious omission in this list of the outcomes sought in counseling and in psychotherapy, that is, *determination.* Perhaps this term smacks too much of Horatio Alger to be acceptable to the disillusioned generations which followed the two World Wars and which experienced two encounters with poverty. However, insofar as planning and execution are expected outcomes of counseling, *determination* to plan and to do something about the plans is an implicit objective of synthesis. It must accompany the understanding and knowledge which equip one to act and the self-acceptance which frees one to act.

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*Professor of Psychology and Education, Teachers College, Columbia University and Consultant, Advanced Systems Development Division, International Business Machines Corporation.

The *planning function* has been stressed by school counselors in college applications and by employment and veterans' counselors in connection with on-the-job training and job placement. But it has been neglected by psychologists who have studied the guidance and counseling processes. We find, as I have in the Career Pattern Study, that a planning orientation to life, and particularly to education and to occupation, is an important factor in vocational maturity and success.[1,2] Many others have found that anticipating and planning for the future are middle-class characteristics which facilitate the attainment of goals.

But as far as I know, no one has ever studied the nature of the planning process, the various methods of facilitating planning in counseling, or their relative effectiveness. Hahn, who devotes several pages to planning in his recent discussion of the appraisal process and whose directive approach to self-actualization suggests that he would be one to do the topic justice, actually deals largely with appraisal and says little about planning.[3] Even Tiedeman and O'Hara's helpful paradigm is still a virtually neglected model rather than the outline of a tested procedure.[4] One criticism frequently made by the former vocational counseling clients of consulting psychologists, judging by the sample I have seen or heard from during the past 20 years, is that while they have learned a great deal about themselves as a result of testing, they have had no help in deciding what to do with their talents.

The Planning Process

This failure to study a major counseling process comes to light dramatically, as do other deficiencies, when one starts to

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[1] Super and Overstreet. op. cit.

[2] Super, D. E., Kowalski, Ruth S., and Gotkin, Elizabeth H. *Floundering and trial after high school.* New York City, N.Y.: Teachers College, Columbia University, 1967. Mimeographed report.

[3] Hahn, M. E. *Psychoevaluation.* New York: McGraw-Hill, 1963.

[4] Tiedeman, D. V., and O'Hara, R. P. *Career development: Choice and adjustment.* New York: College Entrance Examination Board, 1963.

develop a counseling model for use in a computer-support system. In the International Business Machines-Teachers College project we began by talking glibly about a *Plans Charting Phase* in which we would capitalize on planning knowledge as a vocational maturity factor derived from my longitudinal study. We soon found that, although we know something about the kinds of planning adolescents do, and even how much of each kind, we know little about how to facilitate planning. We found that, although the "how to do it" literature abounds in forms for self-analysis and for plotting one's career, these are strictly armchair-developed even though sometimes classroom-tested for user acceptability.

For the time being, then, we must work *a priori,* but this time with the intention that program planning will lead to empirical analyses. So, if I may paraphrase Henry V, "Once more into the armchair, dear friends once more; we'll fill their breach with our untested ideas!"

Assuming that self and situational exploration and analysis have already taken place, that attention has been given to synthesizing the results, and that, although in practice these two processes continue while planning goes on, the subject has reached the place in the model at which planning is pertinent and has a factual and affective base.

Surveying Alternatives

Listing.—Given the results of the analysis and synthesis, the first logical step is to list the alternative plans which appear to be open to one with the personal and situational characteristics and with the objectives of the subject in question. Expectancy tables, followup studies of students and clients, and longitudinal investigations, such as the Career Development Study, the Career Pattern Study, and Project Talent, provide data useful in showing such career paths.

Trying.—The most likely outcomes of pursuing a given path to a goal can then be explored, drawing on the same types of data. This is essentially the games-playing method which Boocock and Coleman have so imaginatively exploited in social interaction.[5] However, it appears likely that some other method must be used to make it equally effective in student-computer interaction, for the affective rewards from the social group seem to be greater than the intellectual rewards of the computer terminal in the games as now organized. The *Parchesi* model may still, nevertheless, prove sufficiently appealing when adapted to individual as contrasted to group use. Much-abbreviated versions tried out in the IBM system seem to confirm this.

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[5] Boocock, Sarane, and Coleman, J. S. "Games with simulated environment in learning." *Sociology of Education,* 1966, 39: 215–236.

Expanding.—Having listed and tried the most evident or most appealing alternative plans, the model calls for reexamination of the list to see whether it should be expanded as indicated by reality testing in capsule form in the guidance situation. The motivation to expand the list of means to attain the objective may stem from dissatisfaction with anticipated outcomes of the selected alternatives. It may come from possibilities perceived differently, or even for the first time, in the trial or games-playing process. Additions to the list may call for a shift back to an earlier function, that of analyzing situations or exploring opportunities in a previously neglected educational or occupational field.

Choice

Listing, trying, and perhaps expanding, lead to decisionmaking, to choosing between alternatives. Tiedeman and O'Hara call this a crystallization process which precedes choice, and from which choice, itself a process, flows. It seems more parsimonious to view choice as a somewhat larger process in which Tiedeman and O'Hara's two processes are one continuous process with a decision as the outcome.[6]

Here is a semantic problem for both the terms *choice* and *decision* denote both the process and the product which we cannot, in English, differentiate. It would be helpful to suggest, even though unrealistic, to call the chosen alternative the *chosen* rather than the *choice,* the *decided* rather than the *decision,* leaving these latter terms to denote the process. Let me note too, that while Tiedeman and O'Hara write in their monograph about choice of *occupation,* we are concerned here with choice of *means of attaining* that occupational objective.

Choice of route.—The means of attaining a given objective are generally not unique, especially in a free society and an enterprise economy. For example, a list of plans to become an electronic technician may show the alternative paths of (1) immediate full-time enrollment in a technical institute, (2) seeking an entry job in an electronics-related enterprise such as a radio factory or a TV repair shop and going to night school, or (3) enlisting in a branch of the armed services which provides that type of training and assignment. From among these suggested routes listed the would-be electronics technician may choose in planning to reach his occupational objective. They are the trial processes, games playing, interviewing about an occupation, and reading occupational biographies which provide the basis for deciding on one pathway rather than another. The values which may be maximized by a given route help make the decision. For example, earning while learning in night school may make it easier to have a car and to date, but learning more rapidly while foregoing possible earnings as a full-time student may lead sooner to higher job status and greater earnings. The guidance system should clarify what these values are and how they may be affected by a particular plan.

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[6] Tiedeman and O'Hara, op. cit.

Choice of steps.—Choices also are concerned with the steps in a plan, which steps to take, and the time to take them. Having chosen one of the alternative routes as a result of the trial process described earlier, the task is now to examine the necessary steps in somewhat more detail, to make a calendar or schedule for taking them, and to specify what action is necessary for each. If the student decides on the technical institute path, he must develop a list of suitable institutions, obtain catalogs, visit facilities, talk with people who can give him a basis for ranking them in order of preference, decide on the number to which he should apply to be sure of admission to some suitable program, obtain necessary admission forms, and finally apply. Supplementary steps include presenting himself effectively in his application and selecting the most appropriate references. Sometimes there are no choices involved in planning these specific steps, but sometimes there are conflicting considerations to weigh and to resolve. Relevant data need to be assembled and decisions made. The student often needs help in identifying issues, assigning weights to the various considerations, recognizing the need to act, and initiating the action.

Contingencies.—It was not a school counselor who wrote about the "best-laid schemes o' mice and men," but counselors often need to remind students that schemes "gang aft agley." One guidance function is to help foresee possible contingencies, assess their probabilities, decide which contingencies to incorporate in their planning, and determine how to provide for them. Money saved while working during vacations and weekends in high school in order to defray college expenses exceeding parental resources may be consumed by a widowed mother's illness. An anticipated opening in the local factory's training program may be wiped out, just before high school graduation, by the parent company's decision to retrench in that area. The guidance system should confront the student with such possibilities and help him identify steps which he may take, instead of those contemplated, should such contingencies arise. Realistically, it may actually prove to be an unforeseen contingency that confronts him later in real life. Napoleon observed this when he said: "The enemy always has three alternatives, and he invariably chooses the fourth." Planning for contingencies is nevertheless an exercise in realism and flexibility which can be made to have transfer value.

Resources: Identification and Use

How a student identifies potential resources for executing plans, and how he uses them, are other important aspects of vocational maturity.[7] A guidance and counseling system should therefore provide assistance in ascertaining the resources which are or might be made available to a student for carrying out his plans. It should teach him how such resources may be used effectively.

Identifying resources.—The first step is to locate the appropriate resources. A gifted girl who wanted to do biological research planned to attend a nearby State teachers college, despite its weak science program, because she could not afford to go away to school. Her counselor helped her realize that a girl with her record could get an all-expense scholarship at a certain scientifically strong college. A college student interested in a particular kind of summer experience thought only in terms of his own institution's research station, despite certain drawbacks of which he was well aware. A neighbor happened to mention a more appropriate institute directed by a friend to whom he was glad to write, recommending the student. A bright young butcher working in a supermarket had decided to quit his job and look for something better when a counselor persuaded him to develop, in two or three sessions, a promotion chart for his company helping him to see that the opportunity he sought existed where he was.

Using resources.—After resources have been identified, questions of tactics in using them become important. The girl biologist had to understand how to make a good case for scholarship support at a highly selective college even though her father's job title made her family seem more affluent than it was. The college student seeking specialized summer experience related to his major needed to think through how to use a personal contact without misusing it. The butcher had to plan ways of self-advancement which would win support rather than antagonize superiors and coworkers. Such information often exists in the counselor's experience repertoire. It gets into the literature only in more general terms, although material on college admissions and scholarships is now becoming increasingly specific. In static form for mass distribution, however, information of these types sometimes seems cold and calculating, likely to repel or encourage abuse.

* * *

One is tempted, in concluding a paper on this topic, to devote some attention to the fourth and last basic function, that of execution. It would be interesting and informative to analyze the tasks of execution and describe the counselor's and computer's role. But that is beyond the scope of this paper, which was to place the planning of personal career development in its context, to describe the planning function as one involving the processes of specifying alternative routes to an objective, choosing one of these paths, and using resources for the pursuit of that course. Each process involves its own more specific steps. Alternatives must be listed, tried out in capsule form, and sometimes expanded. Choice must be made of one possible route to the objectives, further choices must be made of specific steps along the path and of ways to take them, and contingencies must be foreseen and provided for. Resources which may help attain an objective must be identified and selected, and tactics must be decided upon to guide their use. The better laid the schemes of men, the less apt they are to go "agley."

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[7] Super and Overstreet, *op. cit.*

Learning To Make Wise Decisions

L. C. Martin Katz*

We know that students can learn to make smooth bookshelves, grammatical English sentences, accurate arithmetic computations, and shaky Latin-to-English translations. In each, the skill can be defined in terms of an immediate product or outcome, and this product can be assessed with some degree of precision against some consensual mastery standard. But defining "wise decisions" in terms of career outcomes is not only difficult; it is presumptuous. Tennyson wrote, "No man can be more wise than destiny." Changing this title "Wise Decisions" to "Making Decisions Wisely" would be preferable thus shifting the emphasis from content to process. The term "wise decisions" implies an understanding of outcomes and a mastery over events to which we cannot aspire. "Making decisions wisely," on the other hand, implies an understanding of self and a mastery over processes which may be more attainable. It is in this sense of wisdom that Tennyson is contradicted by the old Latin motto, *Fato prudentia major* (wisdom is stronger than fate).

The problem of identifying wise decisions is not just the time-lag between the choice-point and the judgment day — the day when all the evidence on consequences of the choice is in. Nor is it just a matter of insufficient predictive validity. Predictive data are really historical data, and our predictions are manifestations of what we have learned from history. Thus, if our predictors had a validity coefficient of 1.0, we could extend the aphorism "those who do not learn from history are condemned to repeat it," by adding "*and* those who learn from history are also condemned to repeat it." But in fact we do not repeat history, even when events materialize as predicted. For there is always a surplus of events—there are more events than predictions. Paraphrasing this observation in decision terms, it becomes a proposition: the outcomes of decisions exceed the purposes of decisionmakers. Any decision that is not trivial has ramifications without end. Each outcome then may generate new purposes and new decisions, leading in turn to more outcomes, and so on *ad infinitum*. Thus the original purposes and predictions may be buried under this landslide of outcomes and decisions and outcomes.

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*Senior Research Psychologist, Educational Testing Service, Princeton, N.J.

Consider, for example, the decision of the U.S. Government to support Diem in South Vietnam. One may argue that this was a wise decision in that its purposes were (and are being) fulfilled as predicted. But no one maintains that all outcomes of that decision were predicted, and we have no granaries for storing the surplus events until such time as we need them—or are better able to cope with them.

For the sake of argument, however, let us suppose that we have predicted and can evaluate the ramified outcomes of this decision as in some sense superior to those which would have been produced by any alternative decision. Even then, what would the substantive payoff of this decision reinforce? The content itself? But this same decision is not likely to come up again, and we are hard put to claim an increment in *wisdom* from the decision's content. Such content is not likely to be transferable to the next decision, and the next.

In fact, what one learns from the multitude of real-life outcomes may or may not be relevant to wisdom. Like Mark Twain's cat, who learned from sitting on a hot stove never to sit on any stove again, we may learn from these outcomes more "wisdom" than is in them. For example, the current overflow of outcomes from the Vietnam decision might teach us to revert to isolationism, or the little boy who is spanked for turning the faucets on full blast and flooding the bathroom may learn not to wash his hands.

It is these tendencies to generalize that lead behaviorists to concern themselves with what Skinner calls "contingencies" in reinforcement schedules. Or as O. H. Mowrer once put it in a classroom discussion of one of his learning experiments, "You've got to be smarter than the rat." This is well said, since such an approach to defining wisdom in terms of outcomes requires that wisdom reside in the experimenter—or counselor, not in the subject—or student. But this is where the presumption comes in. Do counselors know which decisions are wise?

But are there not "universally desired" outcomes that represent a cultural consensus or folk wisdom for which the counselor may serve as spokesman? Let us grant this, while noting that we may retain some squeamishness about our ability to identify such universals even in retrospect, let alone in advance. (Incidentally, a researcher looking for propositions on which there was universal agreement among college students reported to us not long ago that he had encountered very few. In the college student culture, at least, almost every statement he could think of aroused some dissent, such as "God is good," "we should obey the law," "we should get as much education as possible," "we should respect the flag." Finally, the statement which most closely approximated universal agreement was: "We should brush our teeth every day." So the established wisdom of this culture seems to hold that oral hygiene is good, and that toothbrushing is indeed instrumental in attaining that universal good.) Presumably, we can teach students to make these decisions that lead, at least with a high probability degree and low risk, to universally desired outcomes.

Identifying such universals and inducing students to learn them is not really a concern of decisionmaking or guidance. Rather, it is concerned with indoctrination which makes up a large part of an individual's schooling. The distinctive concern of guidance, however, is not with the *universals* but with *alternatives* toward which the culture tends to be more permissive.

Although I am indebted to B. Othanel Smith and others for the nomenclature of this distinction, i.e., between the *universals* and the *alternatives,* I am churlish enough to express some dissatisfaction with the latter term. The individual is not always constrained to choose from clearly shaped alternatives already "there" like the options in a multiple-choice test. He often has some opportunity to construct or create his own options—in the sense that the poet creates his verses, perhaps creates alternative verses, before choosing the ones he wants. One who writes "creatively" is not merely choosing alternatives from his total vocabulary, any more than the painter is merely choosing colors and lines from an existing pool of options. He does not find his new and unique combinations, variations, and transformations by considering all possible permutations. Fifty chimpanzees typing for 50 years might compose the complete works of Shakespeare, but they wouldn't know how to write a new work of similar quality. In terms of content and outcomes, they might have made "wise" decisions, and yet they would be none the wiser. As critics, we can evaluate the poet's decisions, recognize them as creative, or wise, and teach someone to memorize them. We can even derive and apply rules for content transfer. For example, we can analyze a line like "Now is the winter of our discontent" and recognize an association between emotion or state of mind and a season of the year, in which season is used to represent feeling. No doubt, a computer could be programed to ring the changes on this kind of association, with such results as "Now is the summer of my happiness," "Now is the spring of my joy," "Now is the autumn of my melancholy," *ad nauseam*. But could it ever make the long leap from this last to reach "My way of life is fallen into the sere, the yellow leaf. . ."? This illustrates, I think, the gap between *recognition* of a creative, or wise, decision and the ability to make one. How often the best and wisest decision is not to choose between historically "given" alternatives, but to construct a new option. Like able students who squirm at being forced to choose the best of five bad options on a multiple-choice test question, our wisest decisionmakers can sometimes think of a better response than any given. However, any dissatisfaction with the term *alternatives* does not diminish its usefulness as a contrast with *universals.*

How a choice comes out, and even how one chooses between alternatives, may be less important than how one constructs alternatives. In this view, wisdom derives not from the decision outcome but from the decisionmaking process. And our greatest folk-wisdom, our most compelling *universal,* may apply most directly to the process of constructing and choosing alternatives. May we not regard democracy itself as an evolving process of decisionmaking? It is its processes, not the content of any one policy decision, that make it distinctive.

We recognize, as a crucial characteristic for the processes by which we ideally make national policy decisions, that our society is pluralistic. Competing interests and pressure groups are heard on every issue. Sometimes they differ on predictions of outcomes—for example, the effects of a tax increase on the economy. More often, and more significantly, they have different desirability definitions, different objectives, even when they agree on predictions of outcomes. How do these differences get resolved "wisely"? The necessary condition, we believe, is freedom—the open marketplace of ideas, in which every voice can be heard and judged. Out of this confrontation of competing values, the legislative or executive can find—or claim to find—a consensus for decision, to be translated into a mandate for action. But it does not stop there. The process is ongoing, permitting revision of content in accordance not just with outcomes but also with changes in values and objectives. This provision for change, this ability to accommodate to new situations and circumstances, has perhaps insured the survival of democracy, up till now, through so many vicissitudes.

The individual too recognizes that he must choose between competing values. How then does he make order out of the rabble of impulses that beset him? They should be neither suppressed nor blindly obeyed, but brought under the rule of reason, each given "equal time" and attention. The individual, like the nation, must hold himself open and receptive to different values, allowing each to speak to him as loudly as the others. This process involves active and systematic *examination* and *exploration* of competing values.

One way in which he can examine values is to study their sources, as one studies word derivations to better understand their meanings. Here we see a nice articulation of education and guidance. If a major purpose of education is to transmit the culture, an important purpose of guidance is to help the individual come to terms with the culture—that is, the choices he makes will indicate how he sees himself in the culture. But first he must see the culture in himself. So his first question must be, where have my values come from? Then he will be better prepared to ask, where are they taking me?

One way in which he can explore values is through role-playing. We respond favorably to the notion of career decisionmaking games, because we recognize the freedom that the game can give the individual to try on various roles for size and to act "as if." So far, the career games we have seen involve limited fixed roles. What if we constructed roles flexibly, after we have learned how the individual construes his own values? A computerized game might then set him a role (a "person" in the game) with a different value system from his own, perhaps even reversing his own. Then he can work through the algorithms of decisionmaking with this contrasting value system. (Compare the role-playing assignments that George Kelly prescribed for clients to rehearse and try out.) Indeed, one could build into the computer a "deck" of roles representing major typologies, so that the computer could readily summon a type that is distinctly different from the individual's own initially expressed value system. Just as one can extend and make more precise the understanding of a word's meaning by looking at antonyms, so he may be able to make his own value system more explicit by testing what it is (as he presently construes it) against what it is not. The game thus forcibly but pleasantly gets the individual to explore and reexamine values, not just accept them. It frees him to think about them not as "givens" but as his own *constructs,* which he is then free to *reconstruct.* Career games are just one resource for the comprehensive K-12 curriculum in career development—to include decisionmaking and occupational-educational information—that is needed. I have outlined such a curriculum for school districts as far apart as Philadelphia and Palo Alto. Interest is strong. All we need is money.

When the student has taken full cognizance of the range of cultural values and has formulated his own value system quite explicitly, he will be ready to lay his values on the line in making a decision. The specifics of a strategy for accomplishing this I have described elsewhere.[1] But I want to emphasize that with the individual, as with the Nation, decisionmaking should be an ongoing process, subject to continual revision. Otherwise, he may run afoul of the warning that "the only thing worse than not getting what you want is getting it."

Let me exemplify this point with an old vaudeville routine about wisdom that seem apropos:

> "To what do you attribute your great wisdom, Mr. Bones?"
> "That comes from good judgment, Mr. Jones."

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[1] Katz, Martin L. C. "A Model of guidance for career decision-making," *Vocational Guidance Quarterly,* 15: 2–10, 1966.

"How did you get good judgment?"
"Oh, that comes from experience."
"And how did you get experience?"
"That comes from bad judgment."

Perhaps we may add to this routine Shaw's dictum that "Men are wise in proportion not to their experience but to their capacity for experience."

In shunning a definition of wise decisions in terms of content, or predicted outcome, I have assumed that experience does not teach us what will be best for the individual (or society) except freedom to work things out. Thus, I have defined the best choice as the choice that is most nearly free, but I do not define freedom as complete laissez faire. Rather, it is the freedom (expressed by Shaw in the preface to *Man and Superman* and quoted by Freud in contrasting his "reality principle" with his "pleasure principle") "to be able to choose the line of greatest advantage instead of yielding in the path of least resistance." So without directing an individual's choice of content, we think we can help in the choosing process. This emphasis on process does not pretend to insure the "right" choice—except insofar as the right choice is defined as an informed and rational choice. Our bias—our conviction—is that in education enlightened processes are intrinsically important. Therefore, we bend our efforts to increase the student's understanding of the factors involved in choice (imperfect though our own understanding may be) so that he can take responsibility for his own decisionmaking, examine himself and explore his options in a systematic and comprehensive way, take purposeful action in testing hypotheses about himself in various situations, and exercise flexibility in devising alternate plans.

In short, we do not want to play the decisionmaking game for him. We want to help him master the strategies for rational behavior in the face of uncertainty (which may be the nearest he can get to wisdom) so that he can play the game effectively himself.

Horace, in one of his satires, asked "Who then is free?" and answered "The wise man who can govern himself." Let me, for my tag line, make "free" with Horace, and interchange the descriptors, to ask, "Who then is wise?" and answer "The man who can govern himself freely."

Learning About Opportunities For Adult Activities and Roles at the College Level

Paul R. Lohnes*

An important developmental task for almost any college student is the crystallization of an occupational goal and a strategy for pursuing that goal. During his high school years the student may well have postponed serious consideration of an ultimate occupational objective in favor of concentrating on preparing for and gaining college admission. The initial period following college matriculation is likely to be one of preoccupation with the new demands and opportunities of college life. In the first year or two the student may retain a sense of virtually unlimited personal possibilities. There comes a point, however, when the college forces him to face a choice that may circumscribe his potential futures rather rigorously, leaving perhaps considerable latitude of opportunity within the circle, but inevitably excluding a larger universe of opportunities. This dramatic point at which the bright and ambitious student may be required to circumscribe his multipotentiality for the first time is reached when the college requires him to select a major field of concentration. The reflective student who understands the implications of choosing a major may well experience an identity crisis in the face of this task.

The institution promoting this problem should provide assistance to its students in their career development struggles. A career guidance services program should be available to all college students. In general, the program should help each student know himself better, understand the educational and vocational structure of our society, and relate this knowledge in exploring his career potentialities. This leads to crystallization of career goals and a strategy for pursuing them through a planned series of personal initiatives, educational and otherwise. Specifically, the prototype college guidance system should focus on helping students choose appropriate and satisfying college majors.

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*Professor of Education at the State University of New York at Buffalo.

Role of the Counselor

The responsibility for providing educational and vocational guidance to students is now usually assigned to the college counseling service. This arrangement presents difficulties in that (1) the average counselor sees himself as the therapist who should be applying himself to helping seriously disturbed young people, and (2) the average counseling resources are so limited that, if a majority of college students sought career guidance, the staff would be completely swamped. What students need from a guidance program is primarily access to relevant information and instruction in how to use that information in personal decisionmaking. Acquiring relevant information and the skill to use it are instructional outcomes of exposure to a pedagogical system. It is important to recognize that the primary function of a college career guidance system will be a pedagogical rather than a counseling function.

The design problem of a college career guidance system may be described as a minimax problem, since it is necessary to minimize professional personnel requirements and, at the same time, to maximize encouragement and assistance to students in solving their developmental tasks. Extensive guidance services for a majority of college students can only be accomplished by an auto-instructional system which minimizes counselor contacts. Through a core of auto-instructional experiences students could learn rubrics and relevant generalizations of career development psychology, implications of trait profiles for career adjustments, and aspects of sociology and economics in the world of work.

The guidance system would give students an opportunity to turn to a counselor when and if a serious discontinuity occurred in self-exploration and personal planning processes. When the student recognizes a need for assistance in bridging a discontinuity, the counselor would be available. However, the auto-instructional system would have provided considerable help for the student in exploring his problem before he sees the counselor. The auto-instructional curriculum would have taught the student how to analyze his discontinuity so that he could express it rather clearly, examining it in terms of his personal history, values, and needs. Equipped with such analysis, the student would then turn to the counselor with much of the spadework on his problem already done.

Another area in which the auto-instructional curriculum might prepare the student for counselor interviews is that of what he may expect from counseling. He should be provided with a clear notion of what counseling is and of what it is not, of what the counselor can and can not do. The auto-instructional sequences could clarify the idea that, if after the counselor has given whatever help he can, it will still be the student's responsibility to reach his own decisions and shape his own initiatives in resolving his problem. It should also be made clear that the counselor is not in the information-dispensing business, so that when information needs again achieve ascendancy over emotional needs the client would be expected to leave the counselor and return to the auto-instructional curriculum.

The distinguishing characteristic of this concept of a career guidance program is that all pedagogical and data functions are assigned to auto-instructional sequences to conserve counselor contacts for student-identity emergencies when he must have human support.

Implications of Systems Analysis

In commenting favorably on the potential of the systems analysis approach for educational research and development in 1967, Henry Chauncey, President of the Educational Testing Service, described two stages of the method:

> The first requirement of any systems approach is to formulate a precise statement of what is to be accomplished, of what the system as a whole should be able *to do*. At this point, the big pitfall is to include a specification of the means in the statement of the desired effects. Once the objectives have been defined, uncontaminated by specified means, the systems approach requires an analysis of the precondition that will bring about the desired result—and the preconditions that will bring about this precondition, and so on. The analysis proceeds *backward* from the stated goal . . .[1]

The preceding analysis of the counselor's role is an illustration of this approach in that an effort to start with a statement of college students' needs led to a pedagogical system concept for which the counselor would be an off-line, intermittently branched-to resource. The implication of this approach is that we may err if we start out thinking "computer" just as we may err if we start out thinking "counselor." We should start out thinking "guidance needs" of our intended clients, hoping to encourage creativity of means by deliberately holding means considerations in abeyance. In an abstract of their work on the Systems Development Corporation counseling project, John Cogswell and Donald Estavan say that they began with the rules that the system to be created should "exist for the convenience of—and to fulfill the needs of—the user," and that it should be "respectful of the humanity" of the user. They were thinking of a computer-based system from the start, however, and they are frank in admitting that this led to a major problem in the conduct of the research. The usual procedures of system analysis were leading to an over-emphasis on the machine with a corresponding neglect of the man, or the human side of the design.

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[1] Educational Testing Service, 1965-66 Annual Report, Princeton, N.J., 1966. p. 19-20.

Cogswell and Estavan knew how to offset this trend in their work by making special arrangements to concentrate on human factors relative to their man-machine system concept, but their sharing of early problems can be very helpful to us. Although we know intuitively that the extraordinary powers of electronic computing machinery are going to be crucial in solving the means problems in our efforts to develop improved guidance systems, the indication is that we may benefit from a deliberate delay of computer thinking until after a full exploration of the psychology of human learning implied by the primary objectives. That psychological analysis would be conveyed by a fully detailed paradigm of the hierarchy of primary goals, preconditions, preconditions of the first preconditions, and so on. A promising archtype for such a paradigm is Robert Gagne's theoretical hierarchy of learning sets which mediate criterion performance.[2] Gagné's paradigm is essentially this:

Complex Abilities
↑
Basal Knowledges
↑
Differential Aptitudes

In a system analysis analog of the paradigm the arrowheads would be reversed to show the backward process of analysis from the apex of the pyramid, where the objectives are, toward the base, where the inventory of preconditions of preconditions is. Then a subbasement would finally be added to contain the means analysis. Figure 1 conveys this abstraction. Notice that the influence of Gagné is involved in the assertion that the immediate criterion performance preconditions are likely to be complex abilities, while the secondary preconditions are likely to be simpler cognitive acquisitions termed knowledges. This view of the matter leads to the expectation that there will be two types of content packages available in the system: (1) teaching-learning units, and (2) information retrieval units. The first type of content will hereafter be referred to as *Pedagogy,* and the second as *Data.*

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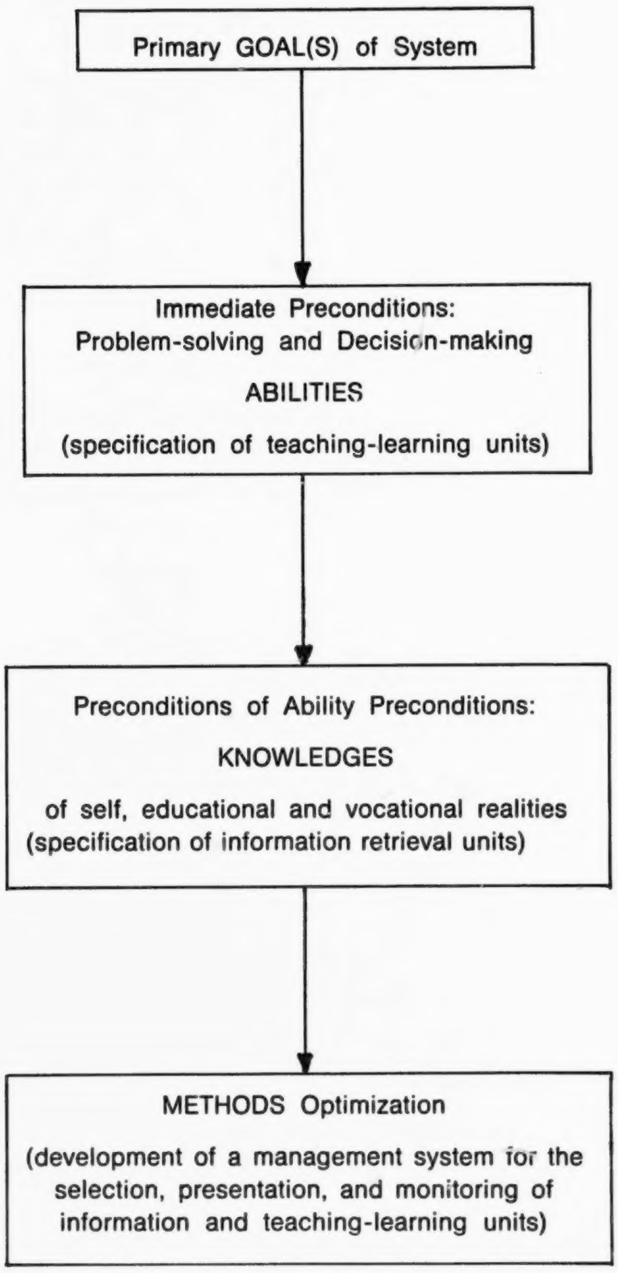
[2] Gagné and Paradise. Abilities and learning sets in knowledge acquisition. *Psychological Monographs,* 75:14, 1961.

Figure 1: Abstracted hierarchical paradigm of system analysis


Primary GOAL(S) of System
Immediate Preconditions:
Problem-solving and Decision-making
ABILITIES
(specification of teaching-learning units)
Preconditions of Ability Preconditions:
KNOWLEDGES
of self, educational and vocational realities
(specification of information retrieval units)
METHODS Optimization
(development of a management system for the selection, presentation, and monitoring of information and teaching-learning units)

Decision *Pedagogy* and career *Data* units are notions that require considerable expansion. First, particular note is due the priority of attention to content dictated by the paradigm. The main point of the paradigm is that content development takes precedence over method development in guidance system development. The presumption is that we should develop content before we develop method because content should influence method more than method influences content. All this is by way of testifying that, after extensive speculating about approaches to developing a career guidance system for college students, I am persuaded that content problems should be solved before method problems are confronted.

Preliminary Analysis of a Career Guidance System

Goal

To have the client (a college freshman or sophomore) make an appropriate, satisfying choice of an area for his college major. Although there are a number of objectives for a fully developed career guidance system for college students, this single goal seems to be the most appropriate focus for a prototype system. The motivation of a large segment, perhaps even a majority, of underclassmen to participate in a prototype system directed to this problem should initially be high. Making an intelligent, satisfying choice of a major area comes closer to being a universal career development task for this population than any other. Granting that participation in a career guidance system is to be voluntary and is to depend for initial motivation on the client's sense of need, this goal is likely to bring a strong student response. It also has significant face validity for faculty, administration, and other sponsors of educational innovation.

Abilities Preconditions Requiring Pedagogy Units

1. Test major areas by (a) relating requirements of selected areas to personal capabilities, (b) relating activities of areas to personal interests, and (c) relating chosen areas to postbaccalaureate opportunities.
2. Test vocational aspirations by (a) relating requirements of one or more vocational fields to personal capabilities and (b) relating opportunities and activities of one or more fields to personal interests and motives.
3. Test self-knowledge by (a) describing a personal value system, (b) describing personal decision system,

and (c) synthesizing and evaluating several hypothetical career sequences one might pursue.

Operators such as *relate, describe, synthesize,* and *evaluate* refer to cognitive processes through which the client is enabled to transform data into information and information into intention. These are complex abilities the learning of which is usually sponsored by teaching. The client can do fairly well with these tasks, since as a college underclassman he has been highly tutored. There are special transformation strategies (e.g., those of multivariate trait psychology) which the client probably has not studied but which are relevant to the special tasks in hand and for which this system should provide instruction. The system would pretest to determine the instructional needs of each student and would posttest to appraise the learning that has occurred. This monitoring would not only control the sequence of presentations for the individual student but would also provide continual refinement of the system. The discouraging thing is that the author knows of very few examples of extant teaching-learning units suitable for incorporation in a prototype system for college students. Most existing units are for high school students. This imposes a severe planning handicap in developing a prototype and reinforces the conviction that content problems require urgent priority.

Knowledge Preconditions Requiring Data Units

1. Determine major areas by (a) forming a total list and (b) getting the relevant details on requirements, activities, and postbaccalaureate outcomes in selected areas.
2. Identify vocational fields by (a) exploring the conceptual map of the universe of all vocational fields and (b) getting the details on more requirements, activities and life-style factors, and long-range career patterns in a few fields.
3. Explore self-concept by having individual examine his abilities profile, his motives (needs, values, interests, goals), and his other resources and limitations.
4. Plan strategies by considering (a) multipotentiality as a concept, (b) a value system, and (c) the role of a decision maker.

Most of these are fairly straightforward content categories implying only the requirement of hard work in collecting and collating the necessary contents. A number of the units could be stocked with Project TALENT materials. Clearly, the student will have to take some tests and inventories. One problem is to find out what the clients actually want to know about activities and life-style factors for major areas and vocational fields. The trouble with most existing college catalogs and vocational information documents is that they tell only what the college or employer wants to tell about the major program or occupation. We will have to ask our clients what their data needs actually are and then undertake to collect the indicated data. We should expect to go to primary data sources; for example, people working in the major areas or vocational fields, to collect much of what the clients will want. We should perhaps be considering ways to send some clients to primary sources to sample activity and life-style factors personally. Cooperative education options that place college students on jobs for short periods of time could be very useful. Students who participate in cooperative education might be asked to report their experiences for the system's data files. These suggested methods are introduced here to dramatize the assumption that students will express some unorthodox data needs that we will not be able to meet quickly and cheaply by collecting from available secondary sources. We are going to encounter major problems in providing all the data units a fully developed system will require, but can probably prepare useful units for a prototype system from TALENT and similar sources quite rapidly.

Methods Optimization

The first condition is that the system media must allow the client to enter the process of career guidance when he wants to. The service should be advertised to underclassmen, but only the client can schedule his initial venture into a process that depends upon the motivational force of his acute awareness of a personal development problem. After entry, the client's schedule with the system should be intensive to conserve his motivation, but it will have to be flexible to work around his other engagements. The initiating unit of the system should explain the objectives, methods, and resources to the client. He should be told about feedback loops so that he will understand the necessity for testing his progress frequently to make adjustments in the plan. He should be assured that the treatment plan will not be simply a prescription for him but that he will be an active participant in the making and revising of the plan. His role as an experimental subject contributing to the improvement of the system itself need not be hidden from him. The second unit then provides a pretest of the client's decision maker, his value structure, and his educational and vocational information inventory as they exist upon entry. The third unit incorporates pretest results in a treatment planning exercise. This unit also has access to selected parts of the college's cumulative file on the student.

Frequent posttesting will be a feature of subsequent pedagogical units to provide inputs to a program of system monitoring, which will also require a complete record of steps, sequences, times, and choices. Monitoring has the dual functions of supporting periodic revisions of the client's treatment plan, including the decision to terminate treatment, and of supporting the continual updating of the system by maintaining a current appraisal of operating characteristics of all units and management procedures. The continual updating of the system is promoted by the use of system media in which units and functions can be easily and cheaply withdrawn, modified, and replaced. Most of these separate units would be preprinted and warehoused at the Career Guidance Center, from where they would be dispensed cafeteria-style to clients. The client would do the work on the units at his residence and would return completed response sheets for scanning transmission to the computer-based management and monitoring routines. The management routine outputs would return from a printer and would guide the client's next draw on the warehouse of units. I think this approach would be feasible, although not optimal. Those who know how Glaser's Individually Prescribed Instruction (IPI) elementary school curriculum program works can see that I have been impressed with it. I would be willing to use this approach in a prototype model if economic realities so indicated.

A more exciting approach would involve the use of media allowing many more and much faster client-system interactions, ideally approaching a full dialog experience for the client. This would require a multimedia computer-terminal learning station at which an input-output typewriter and random access sound-motion videotape clips could be coordinated by the computer-based system. Now I am thinking along lines inspired by Tiedeman's Information System for Vocational Decisions (ISVD) project. Perhaps there is a compromise configuration for the early years of a project that would involve a typewriter console and an independent indexable 35mm slide projector operated by the client following the computer's instructions (e.g., "MOUNT SLIDE TRAY 3 AND DIAL SLIDE 27 PLEASE."). This modest station could be interphased with printed units and optical-scanned responses.

It is easy to digress to the discussion of the media-management guidance system environment when in fact we might better talk first about methods of generating the required content. The first task is to activate a unit writing and unit testing program. Field research will have to be done to collect material for some units, library research for others. Subjects have to be run through units under various experimental arrangements. Provisions for continual, systematic upgrading of units have to be worked out. If we want to develop a career guidance system for college students that will be worthy of the client's time and effort, we will have to face up to and reduce a host of *Content* problems before we can justify an obsession with *Computer* possibilities.

Analysis of Student Attitudes and Beliefs About Counseling

Barbara Rosenquist*

The Systems Development Corporation counseling staff has been continually concerned with the problem of developing a man-machine counseling system that is humanistically oriented. Too often, educational problems are "solved" in ways which belie their true functions, counseling being no exception. Thus, to say that the counseling service objectives are to help students make educational and occupational decisions which will assure them a meaningful and worthwhile position in our society is not necessarily to say that the objectives must be fulfilled irrespective of human consideration.

Yet, in many situations, the human has not been the primary consideration. Today, the student is increasingly protesting that he is but a number in the system—a system that is more concerned with preparing him for his niche than with demonstrating concern for whether he is educated (as opposed to trained) or personally fulfilled.

Several attempts have already been made by the SDC project to insure that the computer does not become an idol which separates man from himself. Even taking the precaution of including the counselors as part of the design team could not forestall such an idolatry. We soon realized that the design ideas were primarily oriented to ways in which the computer might be used to assist the counselors. We realized that little emphasis was placed on determining how the counselors might use their newly found time to help students—or on discovering whether the system, as planned, might even be detrimental to student needs.

This realization prompted several activities. One was a program to train counselors in group techniques and to have them work with students in a group counseling activity. We felt that if counselors were more comfortable working with students in a counseling relationship they might use the computer as one means to gain free time to be with students rather than becoming more immersed in data manipulation. The general reaction to group counseling was positive. As expected, the students had an opportunity to manifest many of their hostilities toward the school. Yet they were pleased that they were allowed the opportunity to express their feelings and opinions. Furthermore, many teachers reported a noticeable difference in students who had previously given them trouble. The teachers seemed eager to participate in such groups themselves and to maintain better communication with the counseling office.

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*Research Assistant, Systems Development Corporation, Santa Monica, Calif.

Another attempt to stress humanistic considerations was to invite a moral and ethical analysis of the proposed system by a class of graduate students in counseling at the University of California at Los Angeles. Their reactions expressed a definite fear for some of the negative properties of computer systems, such as the possibility of increasing the students' feeling of alienation and depersonalization, problems of loss of privacy, and increase of power and control. Altogether, these reactions opened our eyes to the necessity to consider carefully the whole question of values before we inflict computer systems on others.

Still another track we have taken has been to measure the attitudes and beliefs of the counselors with whom we have been working. Although this measure was initially considered an evaluation of the impact the system was having on school counseling, we now see it as an indication of ways in which counseling practice deviates from the counselor's ideal. Our intent is to feed this information back to the counselors to heighten their awareness of how their actions suggest what their values really are.

The SDC counseling staff has also considered the moral and ethical dilemma raised by the design of the man-machine counseling system. In the data analysis we are interested in seeing how closely student attitudes and beliefs about counseling correspond to those commonly held by counselors and system designers.

Using a modified version of the Fishbein Attitude and Belief Scales, we constructed a measure which would give a student orientation to the Attitude and Belief Scales previously developed for the counselors. Twenty-four characteristics of counseling were derived for the senior high; 20 for the junior high. We then obtained a measure of the students' beliefs about the probable existence of each of these characteristics in the school counseling service, their attitudes toward these characteristics, and their overall attitudes toward the counseling service.

Attitudes are defined as the evaluative dimension of a concept; i.e., students were instructed to evaluate each characteristic "like," "dislike," or "I don't know." Similarly, beliefs are defined as the concept's probability dimension, i.e., students were instructed to rate each belief statement "true," "false," or "I don't know."

The attitude and belief scales were presented to the entire junior and senior high school body at the two schools with which we were working. The following analysis is based on the response of 4,215 students, (1,394 in junior high and 2,821 in senior high). Forms returned without the student's grade level were eliminated from the analysis.

For the total group on which adequate data were available, the highest mean attitude ratings were obtained for the following items:

1. Individual counseling.
2. Help with schooling and program changes.
3. Help in understanding test scores in order to decide on a major sequence and receiving information about jobs.
4. Help in understanding one's interests in order to decide on a career plan.

For the junior high students this included help with high school planning, for the senior high help with college advisement.

With only a few exceptions, these items have the smallest percentage of either "dislike" or "I don't know" responses.

On the belief dimension only individual counseling and scheduling and program changes were seen by the students as having a high occurrence rate.

The lower belief ratings for the other activities are primarily because of the high frequency of "I don't know" responses. For the statements referring to counselors giving information about jobs or helping students understand their interests sufficiently to make career plans, the low belief ratings are the result of a high percentage of "false" responses.

The analyses suggest that students view individual counseling primarily in terms of receiving help with their programing and scheduling problems. While these activities are viewed positively, the students also show a concern for what they will be doing after school. They want to know how their interests relate to different occupational areas; they want information about jobs.

These data become very meaningful when compared to the counselors' responses on a similarly worded attitude and belief scale. Counselors are unhappy helping students with programing and scheduling; they see it as being merely a clerical task. They are somewhat interested in interpreting test data which will enable students to make decisions as to their careers in particular programs, but, they show a lack of enthusiasm for getting absorbed in occupational information.

We have long been concerned with the fact that students' career plans are unrealistic and unstable; that students who are most pressed to come to some type of decision put forth only minimal effort in their course work; and further, that these students fail to see the relevance to their lives in most of the required courses.

Some educators feel that the choices that students must make for a mature understanding of the various forces influencing the work world require a maturity which the school has not developed. Many would say that the problem appears to be a general mismatching of time, the defect being that occupational planning is taught for the distant future while the student still lives in the here-and-now world. It is more than this, since increasingly we find students protesting for a more active part in planning their lives—lives which can be meaningful and relevant. We do them an injustice if we refuse to help them plan for this, then later chastise them for living an extended adolescent life.

The next highest attitude ratings pertain to looking at one's cumulative folder, counselors keeping track of the student's progress, bringing people from industry to give talks, and help with school or personal problems. For the senior high students this includes: taking a vocational guidance course, assistance with post high school plans, assistance in finding a job, assistance with scholarships and loans, and followup of student activities after graduation. For the junior high student: counselors helping with high school plans, and taking a short Educational Decisions course. Only four of these characteristics have a comparably high belief rating: tracking, help with school or personal problems, taking a vocational guidance class, and help with post high school plans. Interestingly enough, several of these activities are rated false on their belief aspect: looking at one's cumulative folder, bringing people from industry to discuss jobs, counselors conducting postgraduation followup studies on students, and counselors helping get jobs. Although on the surface these latter activities have the appearance of being unconnected, they all receive low attitude and belief ratings by the counselors. Thus, the suggestion is that counselors are not doing anything in these areas and further that they do not see these activities in the same light as do the students. In fairness to them, their problem is vying for time to make the activities that they are presently engaged in more meaningful to the students before taking on new aspects. Thus, the student ratings suggest an interest in the forces having an influence on their lives rather than a simple concern with immediate gratification. Again the interest in their occupational future emerges. Possibly most pertinent to this interpretation is their interest in seeing their cumulative folder. That does not suggest a complacent attitude whereby students are willing to let school invade their privacy rights without informing them of what student data are being kept and used. In this vein, their attitude on followup studies might be construed as an increased interest in improving the general state of affairs, for others as well as themselves. It seems more and more imperative that educators wake up to the changes in student attitudes instead of insisting that they are the disinterested bystanders of their own lives. While many of these activities show a high frequency of "I don't know" responses, they are primarily on the belief dimension rather than the attitude dimension.

Students evaluated the remaining items neutrally or negatively. These included group counseling; all forms of teacher-counselor or parent-counselor interaction; taking state tests; and the items pertaining to using computers in counseling, namely, computerized interviews for information and counselors using computers. Junior high students taking the short Educational Decisions course rated this course extremely low.

By and large, the low ratings are more influenced by the "dislike" than the "I don't know" responses. Again, some opinion is being demonstrated. The items dealing with teacher-counselor interactions and computers show some exceptions, having a higher percentage of students responding "I don't know." By the mere fact that these activities are covert, the students' responses are entirely reasonable and legitimate. The responses of the counselors to similar items are almost diametrically opposed; counselors indicating very positive attitudes. The picture that emerges is a definite lack of agreement between what students think they need and what counselors think students need. Obviously, an understanding through education has not been very effective.

The scores for these activities are very interesting, and in light of the variety of items included, additional discussion is needed. The attitude rating of group counseling was surprising. It was our supposition that such an activity would be viewed favorably as an opportunity for students to get to question themselves better, through interacting with their peers on the issues having most relevance to them. Nevertheless, more students were unfavorable than favorable to the idea. On the belief dimension, however, the largest percentage responded in the "I don't know" category, followed by the "true" category. It seems then, that because group counseling is not prevalent in our sense of the term, these students are responding to the activity in a different context, the most obvious one being counselors communicating to, but not with, a group of students.

The items having to do with counselor-teacher interaction and counselor-parent interaction point up rather interesting subtleties in student attitudes and beliefs. The students' attitudes toward all these activities are quite low and are especially low for those activities which might be characterized by greater helplessness on the part of the students. Thus, "my teacher and my counselor having a conference about me" suggest a more serious situation than either of the other items dealing with counselor-teacher interaction by itself. Likewise, "counselors sending home information" suggests less opportunity for the student to intervene on his own behalf than does a meeting between his parents and counselor, where supposedly he would be aware of the situation before the fact.

These generalizations are supported by the belief ratings. In total, items dealing with counselor-teacher interaction have much larger percentages of responses in the "I don't know" category. It seems reasonable that the student could conceivably be less informed about this type of activity; if his parents were called in, he would no doubt "hear about it."

This situation might also explain the students' negative attitude, especially in cases where they feel "uptight" about a situation and are uniformed as to what, if anything, is being done about it.

"Taking state test" is characterized by a high frequency of "dislike" responses but a high probability of existence. Students seem to want better test scores so they can improve their decisionmaking, but it is decisionmaking and not a test score that is held in high regard. More than likely the response to this item reflects a distaste for the tedious test-taking process.

On the two items dealing with computers, more dislike is indicated for counselors using computers than for computerized interviews of an information-giving nature. The former item is also characterized by a large percentage of "true" responses whereas belief in the latter is low.

Thus far, the interaction that students have had with computers is confined primarily to filling out IBM scoring sheets or registration forms and suffering the consequences of poorly planned scheduling programs. In an important sense, then, some of the problems to be faced in introducing computers into counseling are compounded by the negative effect already generated among students by the advent of computers. Certainly, information of this sort should provide guidelines as to the types of humanistic problems which must be solved concurrently with those of a system nature.

The response to the Attitude and Belief Scales suggest more student interest in the factors generally considered necessary to the decisionmaking process than has heretofore been acknowledged; moreover, there seems to be a definite interest in having, at the least, some knowledge of the information objectively used by the school to direct the student in his decisionmaking.

It seems more realistic to look at student "negativism" or "apathy" as being a reaction of their lack of control over their destinies than to consider it as a lack of interest.

In the school counselor data collected, there appear to be several problems of differing magnitude which must be considered in developing any computer-assisted counseling system.

First, there is some indication of discrepancy between what counselors in the school and counselors-in-training think counseling is and ought to be. School counselors appear to change their attitudes to fit the role the school has defined for them. While they retain their primary interest in working directly with students and the factors that presently have most influence on them (their parents, teachers, and curriculum), they are likely to be data-oriented and to restrict their activity to those things which can be achieved within the confines of the data and resources presently available at the school.

Second, improvements that the counselors envision do not get at the problems indicated by the analysis of student attitude and belief data. Thus, another problem of possibly greater magnitude revolves around the problem of how counselors are going to use their newly found time. In resolving this problem we must try to update our view of students. No longer is it realistic to consider students silent or apathetic and we must work with them in a manner acknowledging this fact.

In this sense, when school counselors think of improving the counseling service they react positively to the means which will reduce their clerical data-processing chores and enable them to spend more time with students. Thus, computers are viewed positively in at least two senses: they will reduce the time spent processing data, thus freeing some time; and they carry the possibility of providing to students the type of information counselors generally have little interest in, such as occupational information.

Learning to Manage and Managing Personal Development

G. Brian Jones*

Project PLAN, a system of individualized instruction, is now in its first year of operation in grades 1, 5, and 9. Recently while we were separately interviewing the four Project PLAN ninth-grade teachers at one school, each expressed frustrations caused by the same student. They all perceived this student, Jack, as a person capable of much better work and were concerned about his poor academic progress as well as the discipline problems he created. Each teacher pointed out that he needed close supervision because he was unable to concentrate on his learning activities for more than a few minutes, he talked excessively with any one of a group of students with whom he usually sat, and he mishandled instructional materials and equipment.

A discussion with Jack revealed that he believed his academic work was easy and that he was working satisfactorily. His comments included:

"I find it very tempting to fool around in my PLAN classes."

"In some of the courses, I have to read too much and that gets boring."

"I'd like to know if I can get out of two of my PLAN classes."

While expanding the last comment he talked about liking two of his PLAN classes, being disinterested in the third, and having a strong aversive reaction to the fourth. His aversive reaction was toward the subject-matter and the teacher whom he regarded as being too strict and difficult to approach.

Jack agreed with his teachers that he made inefficient use of his classtime, that his performance and ability levels were discrepant, that he really did not know what to do about his disinterested and aversive reactions other than try to get out of those classes and that his negative reactions might generalize to all of his PLAN classes if something were not done to resolve his difficulties. He seemed to be able to manage his problems only by escape behavior and by letting other factors control him, including his peers and what he referred to as "boring" instructional materials.

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*Project Director, American Institutes for Research (Computer-Assisted Vocational Guidance System).

Jack is not an atypical student in Project PLAN. Nor is he representative of students found only in classrooms where individualized instruction is attempted. However, there are educators who believe that students like this are most appropriately placed in conventional, teacher-dominated classrooms. In such settings, teachers might exercise control by enforcing adherence to teacher-or-group-imposed rules, by assigning "plenty of hard work," and by captivating student interest through exhibitionistic displays of well-developed lecture skills. Teachers who exercise this type of control might effectively shape these students so that their classroom behavior is highly task-oriented.

At the same time the possibility exists that because the behavior of these students is controlled by their teachers, they become dependent upon their teachers for whatever they learn. Without the support of a teacher who can exercise such control, the learning progress of these students might suffer.

Even if students like Jack are taught by a teacher who can control their interest and their learning behaviors, they might be difficult for that teacher to identify as students who need assistance in the area of assuming responsibility for their learning. In conventional classrooms the high probability of promoting increased student dependency on the teacher cannot be ignored.

It must be pointed out, however, that there are many teachers who can identify students who need this type of help and who can skillfully manipulate the nature and the degree of their control over student learning so that students gradually are helped to take increased responsibility for their own learning activities. Usually such a teacher has difficulty maintaining his own behavior pattern since neither his peers nor his school system will reward his performance. In fact most teachers are positively reinforced for shaping quiet, disciplined, dependent student behavior. In such a system a student encouraged to take responsibility for his learning one year probably will experience the frustration of finding that such behavior is considered inappropriate by the teacher to whom he is assigned the following year.

It is our hypothesis that if we establish as an instructional objective that students like Jack should be able to assume personal responsibility for their learning, then a classroom operating under individualized instructional conditions presents the optimal setting for helping students achieve this objective. Such a setting is not so completely dependent upon the teacher's skills and imposed control, especially if students, who are capable of participating in the decisionmaking that influences their development, are actually making such decisions. Here, the risk of promoting increased dependency of student on teacher is appreciably decreased.

Our strategy has not been to remove students like Jack from PLAN classes and to reassign them to conventional classes. We are trying to help them to—

(1) Identify their particular learning objectives.

(2) Specify learning experiences that could be more appropriate alternatives than previous experiences were in helping them reach these objectives.

(3) Implement these learning experiences.

(4) Evaluate their effectiveness.

In some cases, a student has to make some personal adjustments; in others, a more effective alternative must be selected from the system in order to accommodate a student's needs; and in cases like Jack's, changes of both types must be made.

No matter which alternative is selected it must be preceded by detailed information about a student including his learning history, his current learning experiences, as well as the personal and system components related to problems he is experiencing. On the basis of this student information it might be decided that a student has not yet acquired behaviors necessary for him to manage his own learning activities. Another possibility is that a student has already acquired these necessary behaviors but is unable to perform them consistently in the classroom. There are often other activities which interfere with his learning activities and these control his performance. Subsequent learning experiences must be specified only after these types of diagnostic decisions have been made.

Student-Managed Performance

To this point this discussion has concentrated on the degree to which one student is capable of taking personal responsibility for his classroom learning activities and is actually managing himself within the classroom. Jack has been portrayed as a student having difficulty doing this in at least one of his PLAN classes.

Within Project PLAN, the guidance and counseling functions are being developed with significant effort being focused on the student problem illustrated by this case study. We have even adopted one of the symbols of innovation by coining our own terminology to represent the behaviors upon which we have focused. The phrase we have been using is "student-managed performance." But we have not limited its applicability to learning behaviors emitted within the classroom.

Student-managed performance refers to just one of three process dimensions that comprise our major efforts. Planning and decisionmaking are the other two processes.

Project PLAN has established as universal objectives that each student should be able to plan to make good decisions and to take responsibility for his educational, vocational, leisure, social, and citizenship development. If a student takes responsibility for his own development in these areas of opportunity, this signifies that he not only is able to plan and make decisions within these areas but also that he is able to implement his plans and carry out his decisions—that is to manage his own performance. A student who can manage his performance does not have to depend upon others to do it for him. He is in control of his own response pattern and will accept responsibility for the way he implements his plans and decisions. He uses other people as resources but does not forfeit the personal freedom of planning, deciding, and implementing.

As noted earlier, we have assumed that there is a difference between response acquisition and response performance. Students can learn how to plan, how to make good decisions, and how to implement resultant plans and decisions, but not be able to do this for their own lives. Our emphasis for all three of these process dimensions will continue to be upon learning and performing.

The title of this paper suggests the use of "personal development" as a generic term. The PLAN guidance and counseling functions are stressing planning, decisionmaking, and management within six areas of personal development. Therefore to be most accurate the area of personal development must be identified in order to make the focus of attention more situationally specific. The final section of this paper will provide one example of what we are trying in one of these six content areas. This example will be a continuation of the discussion presented in the first section. Student-managed performance of learning behaviors in the school setting will be emphasized.

Student-Managed Performance—Learning Behaviors

In concentrating on student management of learning activities our purpose is to help students help themselves within the classroom—to enable them to acquire and exercise control over their learning activities. Here, as in all aspects of individualized instruction, specific behavioral objectives vary with individual student needs. An objective for one student may be to use a more self-initiated approach to solving instructional problems which he encounters and at the same time ask the teacher fewer unnecessary, attention-getting questions. For another student an objective may be to continue his learning activities in spite of distractions and brief interruptions. If these students achieve their objectives, they will have improved management of their learning behaviors.

Individualized Scheduling

While working with some students experiencing motivational problems, we are attempting to implement the concept of individualized scheduling. To do this, some of the teachers and counselors in PLAN are participating in what is an important counseling activity—that is, helping students plan their learning activities and schedule their classroom working time. As they assist students in developing individualized learning schedules, teachers or counselors serve as scheduling strategists. Students are the experts who provide the necessary information about their learning experiences, objectives, and personal interests. Together these students and their strategists develop and implement appropriate schedules.

Some of the steps involved in this individualized scheduling procedure include the following:

1. Student identifies his progress in each PLAN subject area up to the current date.
   a. The rate and quality (or accuracy) level of his performance are calculated.

2. With decisionmaking guidance from the strategist, the student identifies the level of performance he would like to attain within a specified time interval. Examples of data which might be considered include:
   (a) student long-range educational and vocational objectives
   (b) student ability and achievement test scores
   (c) the nature of the learning activities necessary to enable the student to achieve subsequent instructional objectives in his Program of Studies.

3. The student identifies the deficit between his present level of performance and the desired level of performance and states this in the form of his immediate learning objectives.

4. The strategist suggests scheduling alternatives which might help the student achieve his immediate learning objectives. One alternate that is currently being tried by a

number of students involves helping a student learn the simple principle that when we do something that we like very much and make it contingent upon another activity, this activity will tend to be repeated in the future. Once this principle has been learned the strategist and student go through these steps:

(a) Taking one of the student's immediate objectives, they decide what amount of work will be necessary to enable the student to achieve that objective.

(b) They divide this amount of work into a number of learning activities each unit of which they feel he can perform efficiently and effectively without any decrement in the quality of his performance.

(c) They then identify a number of reinforcing activities for the student—things he likes to do and which he can do in a PLAN classroom or school setting.

(d) The student ranks these reinforcing activities from most satisfying to least satisfying.

(e) They then outline a schedule so that a unit of learning activities, which the student does no matter how long it takes him, is immediately followed by a period of time for the reinforcing activity that the student currently ranks highest. Rules of thumb are that the time period for reinforcement should be long enough to be satisfying but not satiating *and* should be no longer than half the time it takes the student to complete his learning activities. Some students quickly learn how to proceed through this scheduling alternative while other students require more attention from the strategist before they acquire this response pattern.

5. The student is then encouraged to implement his scheduling alternative without delay. At first, the strategist checks to see if the student is able to follow the schedule and he positively reinforces the student if he has been able to do it correctly. Scheduling adjustments might be necessary if the student is having difficulty with response performance. Check points must be established so that strategist and student periodically review the student's progress and the schedule's appropriateness.

6. If the student's immediate objective specified how many units of learning activities he wishes to accomplish at a certain quality level by a specific date, the evaluation procedure involves these three variables. In PLAN the performance tests which students take following completion of a teaching-learning unit facilitate this evaluation phase.

(a) If the student achieved his objective, he is encouraged to go through the scheduling process again. The strategist helps him to extend the number of learning activities he can perform without external reinforcing events. The purpose of this strategy is to help students successively approximate a schedule in which they are able to engage in long-range planning and can maintain their learning activities for long periods of time at an optimal level of concentration.

(b) If the student did not achieve his objective, the strategist helps him to investigate all aspects of his schedule and his response performance. Appropriate revisions are made and the cycle is renewed unless the student indicates that he is no longer interested in scheduling and managing his learning activities.

A future extension of individualized scheduling might be the development of computer programs which can facilitate this scheduling process. If a computer could recommend alternate learning schedules which seem to be appropriate to a specific student's needs and interests so that student and strategist could then select one of these or adopt an improved variation, this scheduling process could be expedited. Other computer support might be provided by printouts of the student's daily schedules derived from the more comprehensive schedule he selected and reported to the computer earlier. Perhaps the computer might help the student remember check points he had built into his schedule by notifying him whenever he approaches dates for the completion of a certain unit of learning activities or the taking of a performance test.

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This concept of individualized scheduling provides one example of how we are attempting to help students learn to manage and then actually manage their performance of learning activities in PLAN classrooms. This is indicative of our concern with the processes of decisionmaking, planning, and student-managed performance in a variety of areas. Through procedures such as the scheduling alternative just outlined students like Jack will learn to take responsibility for their personal development and actually be able to manage their own lives without inappropriate dependency on other people or stimulus conditions.

Resolving Personal Problems and Problem Situations

Robert E. Campbell*

The problem of resolving personal problems in human interaction with an educational and vocational guidance system can be considered in two parts. The first involves personal problems experienced by students as they cope with the educational and vocational development process, such as choice conflicts and educational adjustment. More specific personal problem examples, to be called "personal hangups," will be cited later. The second major area involves what will be termed "humanistic reactions to systems technology." The problems in this area deal with the kinds of criticisms frequently heard in resistance to systems approaches. These often represent a humanistic anti "-brave new world" rebellion. Fears of alienation, being manipulated by an electronic God, and depersonalization represent this class of problems. It is our contention that the anti-humanistic responses are not limited to the client but also include implications for the system's designer, the counselor, and other personnel.

Many possible personal and emotional entanglements are superimposed on the educational-vocational-developmental process. This limited list of possible personal hangups illustrates the kinds of problem situations the client will likely encounter:

Vocational goal conflicts and anxieties.

Conflicts generated by the influence of parents and "significant others."

Educational performance (typically underachievement, study skills, and attitudes).

Confusions and conflicts related to values and belief systems.

The selection of the most appropriate psychological work climate or setting, i.e., the congruence of personality typologies and work climate typologies.[1,2,3]

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*Specialist in Occupations Psychology, Center for Vocational and Technical Education, Ohio State University.

[1] Holland, J. L. *The psychology of vocational choice.* Blaisdell, Waltham, Massachusetts, 1966.

[2] Miller, D. C. *Industry and the worker.* In Borow, H. (ed.) *Man in a World of Work*, Houghton Miflin, Boston, 1964.

[3] Roe, Ann. *The psychology of occupations.* Wiley, New York, 1956.

Dependence-independence dilemmas.

Existential concerns, i.e., a search for a philosophical purpose and meaning in life and idiosyncratic goal direction.[4]

Anxieties precipitated by interaction with the systems data bank. For example, Boocock (1967) points out that some girls can become anxious when they learn that others are planning multiple careers and they are not.

The most obvious option for dealing with personal hangups is for the client to see the counselor. Within a systems framework, consulting with the counselor can be initiated either by the client or by the counselor. The client can consult with the counselor in the usual manner or can be reminded of this option by the system, for example, on a computer printout. The counselor can also invite the client for consultation as he observes personal hangups via the system monitor. For example, the counselor may observe as he monitors the system that the client is having difficulty with academic performance and subsequently invites him in for consultation about this problem.

Although this option for dealing with personal problems appears to be very logical, there is a major flaw which concerns me deeply. The flaw is that ostensibly various authorities have argued that one of the major justifications for using data processing and computers is to free the counselor of routine actuarial tasks, in order to have more time for "higher level" counseling. I am not convinced that present counselors have the therapeutic skills to resolve personal hangups effectively. Although I have no concrete evidence to substantiate this conviction other than personal observations and the professional folklore, I would guess that most counselors function as good empathic listeners which is the extent of their therapeutic skills.[5,6]

At this point, some might argue that providing personal adjustment counseling is not within the scope of the school counselor's functions and that, if he is confronted with personal adjustment problems, his major task should be that of referring the client to a diagnostic evaluation center and/or a treatment agency. I believe that the question of whether or not personal adjustment counseling should be within the scope of counselor services is debatable. I do agree that the counselor should utilize school and community referral sources, but it is unrealistic to imagine that the counselor can avoid confrontation with personal adjustment problems. In a recent national guidance survey, it was found that counselors spend a significant portion of their total time in providing personal adjustment counseling relative to other functions.[7] It would follow then that the counselor will need at least two minimal skills in handling personal adjustment problems. The first is to be able to conduct at least gross diagnostic evaluations so that he can make intelligent referrals to the appropriate agencies; and secondly to possess minimal therapeutic skills to deal with moderate but common personal adjustment problems, such as underachievement and parental conflicts. This is the point at which we can introduce innovations within our systems approaches to aid the counselor in dealing with personal hangups.

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[4] Ford, D. H., and Urban, H. B. *Systems of psychotherapy.* Wiley, New York, 1963.

[5] Gysbers, N. C. (chairman). A national seminar on counselor education. The University of Missouri, Columbia, Mo. August 1967.

[6] Thoresen, C. E. The "systems approach" and counselor training: basic features and implications. Presented at the AERA annual meeting in a symposium "A systems approach to counselor selection and training." Chicago, February 1968. Mimeographed.

Three procedures discussed below are suggested: Gross diagnostic scanning, diagnostic evaluation, and behavioral modification through treatment interventions.

Gross diagnostic scanning.—This procedure would help both the client and the counselor in identifying gross symptoms indicative of more severe personal problems.

This would encourage both the client and the counselor to be alert to personal problem indicators and would be somewhat analogous to an electronic early warning system. Within this general procedure, the following specific tasks could be identified:

> 1. In initially expressing personal problems, clients typically have considerable difficulty describing the nature of their problem, such as subjective complaints and symptoms. The intent here is to develop procedures to assist clients in crystallizing their personal problems. The advantage to the client is that he can more specifically see the nature of his problem and he might even see some clues as to how to deal with it. The advantage to the counselor is that it reduces the number of preliminary interviews and may facilitate the diagnostic and subsequent therapeutic process.
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> 2. A somewhat similar, but different, task for the client would be to devise programs which educate him to recognize when he should seek professional help. Perhaps teaching him to be aware of common critical behavioral

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[7] Campbell, R. E. and others. Vocational guidance in secondary education: The results of a national survey. The Center for Vocational and Technical Education, The Ohio State University, Columbus, Ohio, December 1968.

indicators could be incorporated as part of the training program.[8]

3. Colby[9] has been experimenting with the simulation of the neurotic process. Part of his simulation model is designed to recognize conflict areas for the client especially as it pertains to belief systems. Perhaps some of Colby's techniques could be applied to the vocational-educational process for gross diagnostic scanning of personal conflict.

4. Most systems have incorporated a monitoring component to allow for an analysis or for overviewing what has transpired as the client interacts with the system. Although system models vary as to their hopes and uses of the monitoring component, most view it as a mechanism for allowing the counselor to view progress, analyze behavior, and identify client trouble spots. It is my conviction that we will have to give considerable though to educating the counselor to use this mechanism wisely and efficiently. One use might be for gross diagnostic scanning in which case the counselor will need training to identify problem behavioral patterns. More sophisticated systems may want to spot these diagnostic barometers for the counselor.

Diagnostic evaluation.—After the gross identification of possible personal problems by means of diagnostic scanning, the second step is to achieve a more thorough diagnostic evaluation of the student's problem. In other words, at this point the system and the counselor as part of the system need to conduct a more in-depth analysis of the nature of the problem before proceeding with "on-the-spot" treatment or treatment referral. I am not suggesting that the system and/or the counselor perform the kind of intensive diagnostic analysis typically done by a clinical psychologist but at least a minimal diagnostic evaluation to confirm that the student does have a personal problem and that there is a behavioral understanding of the problem.[10]

To accomplish this, we will need to contribute to the counselor's diagnostic skill both by education and by other techniques. As you know, there are a number of computer-based diagnostic projects under development; some of these are aimed at performing an actual diagnosis and/or providing a diagnostic support system, and others are directed toward improving the diagnostic skills of those in the helping specialities.[11,12,13]

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[8] Verville, Elinor. *Behavior problems of children.* Saunders Co., Philadelphia, 1967.

[9] Colby, K. "Computer simulation of change in personal belief systems." *Behavioral Science*, 1967, 12: 248–253.

[10] Kanfer, F. H., and Saslow, G. "Behavioral analysis: an alternative to diagnostic classification." In *Theories of Psychopathology*, T. Million, editor. Saunders Co., Philadelphia, 1967.

Perhaps we could profit from the experiences of those investigators in developing diagnostic evaluation prototypes for the counselor and the system which would help improve the diagnostic skills of the counselor and also provide a diagnostic support system as an adjunct to the total system.

Although I am thinking primarily of diagnostic assistance for common personal problems associated with the educational and vocational process, this eventually could be extended to include a more comprehensive range of personal problems. Common personal problems would include such difficulties as underachievement, and vocational role-choice conflicts. For example, we have learned that underachievers are not a homogeneous group, but require differential diagnosis and differential treatment, i.e., there are different types of underachievers which require varied treatment procedures.[14]

Behavioral modification through treatment intervention.—The third and final step to help resolve personal problems concerned with treatment procedures should include at least three considerations. *The first* is to improve the counselor's skills in providing treatment of more common personal problems of moderate intensity. Although many may feel that most of the personal adjustment counseling should be done by specialists other than the school counselor, I believe that it is impossible to insulate the school counselor entirely from assisting students with personal problems. Hence, we should educate the counselor to deal with the common problems and to recognize his therapeutic limits. He should also be alert to differential diagnosis and differential treatment, i.e., recognizing which techniques are the most appropriate for a given type of problem, such as verbal methods, environmental manipulation, and bibliotherapy. It is also possible to develop software programs to train the counselor in selecting the most appropriate treatment procedure by allowing him to examine different diagnostic typologies represented by case studies and be tested on his selection of the treatment procedure. *The second* consideration is that of treatment referral. The system and/or the counselor

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[11] Bellman, R., Friend, M. B., and Kurland, L. "Simulation of the initial psychiatric interview." *Behavioral Science,* 11, 5, September 1966, p. 389–399.

[12] Tomkins, S. S. and Messick, S. (eds.) *Computer simulation of personality.* New York, Wiley, 1963.

[13] Yelon, S. L. Programmed observation training: an applicaton of systems analysis to counselor training, presented at the AREA annual meeting. In a symposium "A systems approach to counselor selection and training." Chicago, February 1968. Mimeographed paper.

[14] Campbell, R. E., and Hart, D. *Differential diagnosis and differential treatment of underachievers.* The Pennsylvania State University (personal papers), 1965.

will have to make judgments as to which referral sources are most appropriate. He will also have to achieve a liaison working relationship with these referral agencies. This could also be programed as part of the total system. It is conceivable that there may be five or six referral agencies within the community, such as family guidance clinics, and a work evaluation center. It would be the counselor's responsibility to channel the student to the appropriate referral service. *A third* consideration to be included is that of followup to insure that we have helped people resolve their personal problems. It is crucial that adequate followup be accomplished periodically to guard against someone being lost within the system, and to doublecheck to make certain that help with their personal problems is provided. For example, a student could be referred to a treatment agency but be left in limbo for an indefinite period on a waiting list. Followup safeguards could be incorporated to periodically check progress and to monitor treatment dispositions. This could easily be handled by some type of actuarial record system to monitor all phases of helping students resolve personal problems.

In summary, the following has been emphasized:

Counselors cannot avoid confrontation with personal adjustment counseling.

Counselors do not generally have the necessary skills to handle these.

Counselors and/or systems will need two minimal skills to handle student personal problems, diagnosis, and treatment.

The three procedural considerations for assisting the counselor, client, and system in dealing with these problems are gross diagnostic scanning, diagnostic evaluation, and behavioral modification through treatment intervention.

Evaluating Personal Potentials

A. Carp*

The precise definition of the "personal potentials" on which an individual should evaluate himself is still not settled. The continued development of counseling and guidance batteries and the search for aptitude, interest, achievement, and value dimensions bear ample witness to the lack of definitive structure in the field.

There is reasonable consensus that such characteristics as aptitudes, achievements, interests, motives, personality, values and goals (to mention just a few) are relevant to occupational or career choice. But the way in which they interact is not too well known. Of even greater significance is the lack of knowledge about occupational requirements of characteristics except for some rough characterizations of careers in terms of level of intelligence and of the interest patterns of occupational groups. Even here the data are based primarily on the characteristics of those presently engaged rather than on the adolescent characteristics that might be predictive. Even less is known about the demographic and sociological characteristics of occupations as independent contributors to career choice.

Much of the prior research has been done within the framework of selection psychology with the implicit or explicit assumptions of providing tools for the selector to maximize some success criterion. Only relatively recently has the counseling, planning, and self-guidance theme come to the fore. Within a counseling framework, some of the restrictions placed on test development disappear since there is less need to be concerned about responses designed to fool others, although self-deception remains a problem.

Even with our increased sophistication in test development and statistical analyses it has become difficult to demonstrate any increase in the predictability of occupational choice over merely asking the individual what his career plans are. And the stability of career plans is not overwhelming.

It seems that the only way out of the dilemma is the continued effort to collect meaningful data that relate antecedent variables to later events. The main addition to our predictors that I foresee are the inclusion of sociological and demographic factors in our predictor models. If the probability of entry into an occupational field is actually related to race, religion, socioeconomic background, or father's occupation—for example—these factors must be found in our expectancy tables. Hopefully, such research not only produces the expectancies, but points out changes that could or should be made to change these expectancies. A recent Office of Education study indicated that in 1965 only 3 percent of the graduate school enrollment were Negroes.[1] Even here Negroes were over-represented in elementary education and under-represented in business and engineering.

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*Project Director, American Institutes for Research (Project Talent).

Thus the program for evaluating personnel potentials in terms of specific outcomes is an ongoing one. In terms of the relatively low order of predictability obtained to date from high school data, perhaps the greatest contribution to counseling and guidance lies in the direction of providing information to maximize the number of options still remaining to the individual. Followup studies of vocational school graduates indicate that a large number never enter or pursue the field in which they are vocationally trained. The occupational placement ecology and the role of the economy, chance, and fortuitous factors need to find a place in a vocational model.

Equally as important as deriving an individual's description is the need to develop a descriptive occupational profile couched in the same language as the descriptions of individuals. The homogenity/variability of occupations and post-high school outcomes badly needs refinement. The appraisal of personal potentials for an occupational vocational guidance system has real meaning primarily in terms of occupations. Some criteria for occupational analysis set up by Shartle a few years ago are still valid:

> 1. Readily available, flexible, functional occupational classifications to meet the needs of the demographer, the economic statistician, the high school student, the college student, the school or college graduate who is entering the labor force, the employed person who wants to know which way is "up," the unemployed worker who is looking for retraining, and the older worker or the disabled person whose problems may require special attention.
>
> 2. Occupational groupings which can be readily understood by counselors. They must, at the same time, be groupings which can be realistically perceived by counselees. Education and counseling must continue to work to-

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[1] *Academic and Financial Status of Graduate Students*, Spring 1965. U.S. Department of Health, Education, and Welfare, Office of Education. Washington: U.S. Government Printing Office, 1967. (OE–54042) p. 8.

ward the objective of placing counselees in independent roles so that they can make their own decisions.

3. Systems which embody information that not only is up to date but reflects the future to a reasonable extent. Such a system would need to be sensitive to the rapid and ongoing industrial technological changes.

It is our hope that over the next several years, TALENT can contribute meaningfully to answering some of these problems. Flanagan, Cooley, and Lohnes have made a significant start in this direction. I am sure that Cooley and Lohnes will continue their innovative study of career choice using the MAP factors as the primary predictors. Hopefully, they will include as well in future studies the demographic and sociological variables previously mentioned. Their thesis is essentially that the decision model appropriate for counseling can be effectively implemented by describing individuals on a relatively few orthogonal factors and using a relatively few categories of occupations or careers. This is a perfectly reasonable and appropriate assumption.

Yet, in the original definition and development of the TALENT test battery, each test was utilized because of the belief that it contained specific as well as common variance. The Lohnes factors (or any other set of factor scores) may capture all the reliable, unique variance but the evidence is not overwhelming.

If a maximum number of criterion discriminations are to be made, the larger the number of predictors the more the possibility of discrimination exists. As has often been pointed out in classification models, tests or scores correlating in the 80's or 90's still permit differential prediction.

The problem for TALENT, then, is basically an empirical one of defining predictor and criterion variables, then determining expectancies associated with each profile and each criterion. A hierarchical grouping procedure could be used to determine both the number of profiles and the number of dimensions. Are machinists and mechanics the same or different? If the profiles are the same, they are the same; if not, they are different.

As the longitudinal data of TALENT emerges, careers become somewhat more fixed and can be more readily related to predictors. Of course, the enterprise is limited to the data already collected in TALENT but this does represent a wide variety of aptitude, achievement, interest, activity, and biographical data.

At first it appears that as many as 50 or 100 predictor variables related to several hundred occupations may be an interesting exercise in computer bravado but of limited use to the high school counselor or student. Yet this approach is not out of line with the Clarke, Gelatt, and Levine decisionmaking paradigm. A given student's profile may yield the probabilities for all of the occupations for which data are available. Indeed, the discrepancies between a student's plans and the expected occupation may yield more specifics for actions the student might take to change his characteristics than if he is merely informed on the basis of global or composite scores. Prescriptive efforts would be much more successful based on specific tests scores than on global factor scores.

TALENT input data is now almost 10 years old and the probabilities associated with career choice are in one sense postdictive. The counseling procedure and milieu must always be conditional in that at most we know the way things were rather than the way they will be.

Recently, we have started to look at the criterion data at their finest level, distributing every career field on about 120 of the TALENT variables. These data are based on the 5-year followup data for both men and women. The next step will be to refine the career groups by eliminating those cases whose career plans appear to be unrealistic according to certain decision rules. For example, an individual who plans to be a physician but has not yet started college would be eliminated from the physician group. A high school graduate with low math scores and no college would be eliminated from the mathematician criterion group.

Based on a standard metric (so that all four classes can be compared), correlational analyses would be made within groups of a set of predictor variables. Due care would have to be exercised that the number of predictors bears a reasonable relationship to the number of cases but chances can be taken since classes in the 11th, 10th, and 9th grades provide an ideal group for cross validation.

Of as much interest in developing this strategy of group membership is a parallel one of group exclusion. In this changing world of work with its fluctuating economy, stability of work or even of careers (particularly for those fields without a long, formal training prerequisite), stability per se may be a "sometime" thing. The Department of Labor estimates that a young man of 20 with about 40 years of active work life will change jobs at least six or seven times. This is not identical with career change but it is quite suggestive. Indeed, one of the hoped for outcomes of Project TALENT will be more adequate data on job and career stability.

The matrix for predicting occupational outcome must contain not only intraindividual characteristics but also school, community, demographic, and socioeconomic variables. It may very well be that for certain segments of the population these variables markedly outweigh ability and motivational variables. College plans and family expectations, for example, appear to be powerful correlates of college-going behavior. A most exciting prospect is to use guidance and guidance models not just to predict but to interdict. The greatest contribution to producing a greater match between ability and outcome—or at least to insure that talent is not wasted—might be to focus on changing expectations of students, families, and even communities. In fact, a prediction model is only a first and preliminary step to an effective guidance system. The challenge is really to change the prediction by changing the system. It would be no problem to set up such selection criteria that participants in the job corps or hard-core training programs would have a higher probability of success in later life. But devising a training program that would increase the probability of success for those most in need presents quite a challenge.

As a solution to the specific test/factor problem, I envision something like the Strong Vocational Interest approach on both the predictor and criterion side. So called microscores would be presented as well as macroscores or composites or factor scores. Microscores have the advantage perhaps of showing an individual more precisely how and where he is different so that he knows how to change. Similarly occupations could be listed at the micro level to show the specific patterns of microscores and macroscores that define a given occupation. As mentioned earlier, the similarities and differences between occupations define their differential guidance utility.

As Project TALENT moves in to the 10-year followup phase, we can, hopefully, assume that most career decisions have been made. Occupational profiles considering intraindividual and environmental factors could be made with reasonable confidence. The base, at least, for more realistic career studies that cover the full range, the provision of more realistic expectancy tables, and a more meaningful occupational taxonomy lies before us.

Ten Basic Questions in Guidance and School Learning

Thomas L. Hilton*

This paper is devoted to ten basic questions which seem to underlie much current effort to apply computer technology to guidance and school learning. Extensive research has been done on some of the questions, little on others. The questions are summarized here for several reasons. The first is to stimulate discussion. Are they real questions or have they been adequately researched? Are they truly basic? Or are there more basic questions underlying them? The second reason is to stimulate relevant research on those questions which have not been adequately researched. The third reason is to remind those now engaged in developmental efforts that they may have—as a by-product of their efforts—findings relevant to basic questions. The fourth reason is to make explicit any assumptions which developmental research efforts may be making about psychological processes and relationships underlying such efforts.

The questions, in no particular order, follow. Where the author happened to know of relevant research or theory it is mentioned, but these references by no means exhaust the literature.

1. What constraints do the information retention and processing capabilities of humans place on vocational planning and decisionmaking?

Most current developmental work in vocational guidance seems to assume there are no constraints or, at least, if there are constraints the procedures under development should test the limits. In other words, until constraints are discovered, developmental work should proceed as if there were none. The student is viewed as a rational decisionmaker who knows his values, needs, and interests, can recognize viable occupational options, and evaluate them in a fully rational way.

On the other hand, Simon has argued that there are limits to human rationality and has proposed a "satisficing" model of decisionmaking as an alternative to the traditional "economic man" model.[1] Another model, based on Festinger's dissonance reduction theory, was proposed by Hilton.[2] The possible relevance of these models to vocational planning has received little attention.

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*Senior Research Psychologist, Educational Testing Service, Princeton, N. J.

2. What is the transfer value of formal instruction in vocational planning and decisionmaking, or experience in simulated or other contrived situations? Under what conditions is transfer maximal?

The question as stated is a restricted version of a more general question which can be raised about any formal instruction. It is included here more in the interest of completeness than to remind the reader of its importance. Most contemporary researchers seem to be mindful of the question. Krumboltz and Schroeder's work is an example.[3]

Historically the question has received much attention. The transfer value of instruction in Latin, for example, has been a popular subject for 50 years. One might hope, however, that it will not take as long to fully investigate the transfer value of instruction in vocational planning.

3. How stable over long time periods are individual interests and values?

Much of the current developmental work seems to assume that students can accurately assess their interests and values and that these attributes are stable over long periods of time.

Strong,[4] Campbell and Johansson,[5] and others have demonstrated that adolescent interest scores are highly correlated with adult scores, but correlations as high as .8 still leave room for marked individual variation. Others have demonstrated that academic interests change as a result of success in academic areas.[6] Also it has been demonstrated that values as measured by the Allport, Vernon, and Lindzey *Study of Values* can change significantly over as short a period as 9 months.[7]

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[1] Simon, H. A. "A behavioral model of rational choice." *Quarterly Journal of Economics,* 1955, 49: 99–118.

[2] Hilton, T. L. "Career decision-making." *Journal of Counseling Psychology,* 1962, 9: 291–298.

[3] Krumboltz, J. D., and Schroeder, W. W. "Promoting career planning through Reinforcement." *Personnel and Guidance Journal,* 1965, 44: 19–26.

[4] Strong, E. K., Jr. "An 18-year longitudinal report on interests." In *The Strong Vocational Interest Blank: Research and Uses.* Minneapolis: University of Minnesota Press, 1960.

[5] Campbell, D. P., and Johansson, C. B. "Academic interests, scholastic achievements and eventual occupations." *Journal of Counseling Psychology,* 1966, 13: 416–424.

[6] Cooley, W. W. "Interactions among interests, abilities, and career plans." *Journal of Applied Psychology,* 1967, 51: 1–16.

[7] Hilton, T. L., and Korn, J. H. "Measured change in personal values." *Educational and Psychological Measurement,* 1964, 24: 609–622.

Two related questions—assuming that interests do change—would be the following: Under what conditions do new interests emerge in the individual and to what extent can the emergence of stable individual interests be influenced by other individuals (e.g., teachers, parents)?

4. To what extent do childhood and adolescent interests and values predict adult occupational satisfaction and productivity?

Numerous studies have demonstrated that interests are correlated with later occupational involvement.[8] Students tend to enter occupations they are interested in as adolescents. It has also been demonstrated that quality of performance within an occupation is correlated with degree of interest as measured earlier.[9] Within an occupation the more interested individuals tend to perform better. However, to the author's knowledge there have been no studies demonstrating that early interests predict which of several occupations the student is likely to find most satisfying. There is good reason for this, in view of the research design problems involved. One could not, for example, take a large sample of adolescents with the same interests and randomly assign them to occupations. But for the purpose of the present paper, this consideration is irrelevant. We are concerned here only with basic questions, not with how difficult it might be to research them.

5. To what extent do childhood attributes and experiences determine adolescent and adult individual attributes? In other words, to what extent is childhood "formative"?

Summarizing a large body of research, Bloom has concluded that early variables account for a major fraction of the variation in adolescent and adult school and test performance and, thus, that early experience is a critical determinant of development.[10]

One can raise questions, however, about the extent to which degree of growth can be inferred from correlations, particularly when one is dealing with ordinal or, at best, interval scales. Bloom's calculations rest on the assumption that degree of growth at a given point in time is uncorrelated with growth in the next time period. But Thorndike, among others, has shown that as far as intellectual growth is concerned status at any point in time is correlated with subsequent growth.[11] Thus intellectual growth as a critical assumption does not hold[12] in applying Anderson's Overlap Hypotheses to the estimation of proportion to total growth.

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[8] Strong, E. K., Jr. *Vocational interests of men and women.* Palo Alto, Calif. Stanford University Press, 1943.

[9] Kelly, E. L., and Fiske, D. W. *The Prediction of performance in clinical psychology.* Ann Arbor: University of Michigan Press, 1951.

[10] Bloom, B. S. *Stability and change in human characteristics.* New York: John Wiley & Sons, Inc., 1964.

[11] Thorndike, R. L. "Intellectual status and intellectual growth." *Journal of Educational Psychology,* 1966, 57, 121–127.

Furthermore, one can question the implied inevitability of Bloom's conclusions. Do we observe less growth in intelligence during adolescence than during childhood because adolescent experience is inevitably less influential or is it because we are relatively ineffectual as adolescent educators? Have we as educators really tried to overcome early educational deficiencies in, for example, the so-called culturally disadvantaged children?

6. To what extent does formal public school instruction contribute to individual academic growth? In other words, do schools make a difference?

There are really three questions here which are often confounded in the literature. The first is to what extent do schools make a contribution to the total academic growth of students? The second is to what extent do schools contribute differentially to the growth of individual students? That is, do they contribute more to some than to others? And the third is, do some schools contribute more than other schools?

The well-known Coleman Study reports small, almost negligible, correlations between certain school variables and certain measures of student intellectual growth, and concludes from these that the school contributes relatively little to student growth.[13] Questions have been raised, however, about the adequacy of Coleman's measures.[14,15] But assume for the moment that the measures are adequate. Also assume that we can draw inferences about causation from correlations, even though this is true only under special conditions. Is the conclusion warranted? The fact is that we can draw conclusions about amount of growth from correlations only in a limited sense. If we have a sample of school expenditures and the corresponding measures of mean student achievement, we can say only that, *within that range of expenditures,* achievement is either related or relatively unrelated to achievement. We cannot generalize about the full range of expenditures. Suppose that some threshold amount results in a very large increment in academic growth but that beyond this amount additional expenditure increments are accompanied by decreasing increments in gain. The correlation we would obtain between expenditure and achievement would depend on where in the range we took our measures. Over the total range the correlation would be large. Over a narrow range above the threshold the correlation would be small, perhaps even negligible. In any case, if the relationship were as supposed, we could not make a general statement that school expenditure is unrelated to achievement. Least of all could we say—as some have interpreted the Coleman report—that schools make no difference.

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[12] Bloom, *op. cit.*

[13] Coleman, J. S., and others. *Equality of educational opportunity.* Washington, D.C.: U.S. Office of Education, 1966.

[14] Dyer, H. S. "School factors and equal educational opportunities." *Harvard Educational Review* (to appear in winter 1968 issue).

[15] Levin, H. M. "What difference do schools make?" *Saturday Review,* Jan. 20, 1968, 57–68.

Furthermore, if the measures are deficient, as has been argued in the Coleman study, then the conclusion is even more unjustified. In fact, in a subsequent study involving a rescaling and reanalysis of Coleman's data, Mayeske demonstrated that school differences made a substantially greater unique contribution to differences in student performance than Coleman reported.[16] In addition, Shaycoft has reported from Project TALENT data that highly significant differences exist between the graduates of different high schools even when careful multivariate convariant adjustments are made for input differences in student ability and student background.[17] Preliminary efforts by Shaycoft did, however, fail to reveal a relationship between these observed differences and the available measures of certain school variables, a failure which by no means warrants the conclusion that the schools contribute nothing to student achievement.

7. To what extent is academic gain in a given time period related to level or achievement at the beginning of that time? In other words, do the smart children get smarter and the less smart relatively less so? This question is included here in view of its obvious relevance to evaluation of experimental instructional efforts in guidance and school learning and to curriculum development.

In the environmentalist tradition, Bloom has argued that growth in a given time period depends almost entirely on the students' experience during that time period rather than on his attainment at the beginning of the period.[18] On the other hand, Thorndike,[19] and Shaycoft,[20] and studies in progress at Educational Testing Service indicate there is a moderate correlation between achievement at one point in time and gain in achievement in the next time period when steps are taken to avoid regression effects. These studies also demonstrate the importance of using reliable change measures.

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[16] Mayeske, G. W. *A Model for school achievement.* Paper delivered at U. S. Office of Education Symposium: Operation Analysis in Education, (Washington, D.C., November 1967). Mimeographed.

[17] Shaycoft, Marion F. *The high school years: growth in cognitive skills.* Pittsburgh, Pa.: American Institutes for Research and School of Education, University of Pittsburgh, 1967.

[18] Bloom, *op. cit.*

[19] Thorndike, *op. cit.*

[20] Shaycoft, *op. cit.*

Thus, gain in achievement cannot be attributed entirely to the student's experiences in that time period. Gain which is independent of initial status must be separated from gain which is dependent upon initial status. Tucker, Damarin, and Messick,[21] and others earlier, have provided equations for doing this but they have not been widely used.

Many studies which report remarkable gains for students receiving an experimental treatment in comparison to a control group are suspect because differences in initial status are ignored. Some of the confidence that the right kind of learning environment can overcome any past deprivation may not be justified if research continues to show a relationship between present and past learning.

8. To what extent is a student's home environment a determinant of academic growth?

Here again the growth studies mentioned above have produced conflicting results. It seems to depend on how various measures are interpreted and on the order in which they are partialed from, or added to, multiple regression prediction equations. Is parent's education a home environment variable or is it an indirect measure of school quality? Since more educated parents will choose to live in high quality school districts, it can be argued that the children's higher achievement is attributable to the schools rather than to (the parents) education.

Also, the life span in question in terms of years of exposure and level (childhood, adolescence, or other) seems to be critical. Over a short period of the high school years (1½ years) achievement is highly predictable from earlier achievement without consideration of the student's home environment.[22] As another example, the recently published *International Study of Achievement in Mathematics*[23] concluded that cultural expectations are far more important as a source of variance in mathematics attainment than the father's occupation.

9. To what extent do variables of the immediate instructional setting account for long-term variance in learning?

In question here are such variables as the student-teacher ratio, availability of audiovisual aids, opportunity for immediate feedback, carefully sequenced presentations of learning tasks, availability of relevant information, and the opportunity to progress at optimal individual learning rates. Most of us take for granted that this class of variables contributes greatly to the learning rate. One gets the impression, however, that hard evidence from properly controlled experiments is rare, although systematic review of the voluminous literature could prove that this impression was wrong.

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[21] Tucker, L. R., Demarin, F., and Messick, S. "A base-free measure of change." *Psychometrika*, 1966, 31: 457–473.

[22] Hilton, T. L., and Myers, A. E. "Personal background, experience and school achievement: an investigation of the contribution of questionnaire data to academic prediction." *Journal of Educational Measurements*, 1967, 4: 69–80.

[23] Husen, T. (ed.) *International study of achievement in mathematics.* Vols. I and II. Stockholm: Almqvist and Wiksell and New York: Wiley, 1967.

10. Does individual rate of learning differ when all other extra-individual influences on learning are held constant?

Extra-individual influences mean differences in instructional treatments and family, school, community, and cultural sources of variation. One can even exclude individual motivation, thereby restricting the variation in question to cognitive skill, and still have a significant question.

The implicit assumption of some experimental instructional programs, especially those designed for culturally disadvantaged children, seems to be that if motivational and extra-individual influences can somehow be made optimal any child can achieve the same rate of learning as any other child. Although this has been asserted by the proponents of computerized instructional devices, few—if any—empirical demonstrations of the point of view are reported in the literature.

A corollary of this question is the following: Should the formal education of all children be completed in the same, fixed amount of time? No generalization in American education is more universally observed. Only a small percentage of American students take less than or more than 12 years to complete their elementary and secondary school education. The full justification of this practice involves some other questions as, for example, the emotional and social development of students and the economic feasibility of alternative methods of handling widely divergent learning rates.

The question has been the subject of years of educational experimentation and research beginning no less than 25 years ago with Carleton Washburne [24] and continuing at present with Robert Glaser,[25] John Flanagan,[26] and others.

The present prevalent method does give recognition to differing learning rates by curriculum variations within the school, by variations of treatments within curriculum, and by forcing out a substantial number of students, many of whom cannot keep up with the schools' academic pace. It could be argued, then, that the existing procedure emphasizes uniformity of exposure (in terms of years of schooling) while letting the amount of learning vary greatly. Whether this is better than emphasizing uniformity of learning while letting amount of exposure vary is the question being raised here.

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[24] Washburne, C. N. Adapting the schools to individual differences. *Yearbook of the National Society for the Study of Education*, 1925, 24. Part II.

[25] Glaser, R. Adapting the elementary school curriculum to individual performance. In *Proceedings of the 1967 Invitational Conference on Testing Problems*. Princeton, N. J.: Educational Testing Service, 1968. pp. 3–36.

[26] Flanagan, J. C. *Developing a functioning model of an educational system for the 70's*. Palo Alto: American Institute for Research, 1967.

Finally there is a question which, in order not to exceed the author's self-imposed limit of 10 questions, will be considered an aspect of question 10:

> **Are there individuals for whom there is an upper limit on the complexity, abstractness, or total cumulation of their knowledge by virtue of their inheritance or their early experiences, regardless of the education they receive?**

In other words, are there individuals who simply are incapable of high level cognitive functioning? Judging from our educational practices, the assumption seems to be that the answer is "yes." As educators we seem to assume that some time in adolescence the learning capacity of certain students approaches an asymptote and that at that time they should be equipped with whatever practical skills they require to earn a living.

It seems likely that such a limit does exist for children in the subnormal ability group, i.e., children classified as imbeciles or morons. But what of the children of average or somewhat below average ability? That their scores on a variety of cognitive measures tend to level off in adolescence or late adolescence has been widely documented. This observed tendency could conceivably be an artifact of the measures and scaling procedures used, but let us assume that this is not the case. The question becomes whether the leveling off is inevitable. It could be argued that the growth deceleration represents a cumulative learning deficit or environmental circumstance which could be counteracted by concerted educational effort. This would, in turn, raise difficult social and economic problems concerning the allocation and use of our national resources. But in this paper we have been concerned with psychological questions. The author's conclusion is that there are enough of these to busy researchers for the indefinite future.

PART II

problems of implementation

UNIVERSITY
CENTRAL HIGH SCHOOL
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Computer Systems for Guidance

William W. Cooley*

In considering computer applications for guidance, the temptation is to identify the major data processing tasks which have faced guidance workers in the past and then attempt to speed things up with the aid of the computer. For example, the initial school applications of the computer have been designed to achieve more efficient scheduling of the same old course offerings, more efficient production of the same old report cards, faster scoring of the same old tests, and highspeed access to computer-stored cumulative records with the same old teacher grades.

One difficulty with this direct approach is that computer technology application is a very expensive process, so it is quite important to be rather certain that the processes being made more efficient through automation are worth doing at all. There is also the problem that automation, instead of producing flexibility as one should expect, tends to make procedures more rigid because of the large cost involved in changing computer procedures once they are installed and operating.

As we consider how guidance functions might be improved by taking advantage of the computer's availability, a relevant question which must be considered is, "What are schools going to be like by the time computer systems become generally available in the schools?" Given the uncertain support and role that guidance services have had in the schools in the past, it is not likely that computers will become available to schools simply because guidance needs them. Only when computers are used for a broad range of educational applications will they find their way into most school systems. Thus, it is probable that by the time computers are available for guidance these schools will be different enough to present guidance personnel with problems that are qualitatively different from those problems which are their responsibility today. Guidance functions certainly cannot be considered independent of other aspects of the school. The probable nature of the future school must be considered along with the probable nature of future guidance functions as we plan computer systems for the schools of tomorrow.

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*Professor of Education, Program of Studies in Educational Research and Learning Research and Development Center, University of Pittsburgh.

Although it is easy enough to request that we consider the future, the actual prediction of educational futures is an extremely hazardous task. When one ponders the numerous innovations which "sweep the country" from decade to decade, it is quite sobering to note that these so-called transformations of the schools are taking place in a few highly visible school systems while most schools remain unchanged.

One important trend that is beginning to be discernible is the development of a completely new type of school, where the key word is individualization. All around us, from *Look Magazine* to the *Harvard Educational Review,* from Marshall McLuhan to John Goodlad, this theme is heard. Although the search for workable educational programs which attempt to take into account student differences has been going on for generations, only since about 1959 have they begun to be adopted in schools in any numbers. They come with different names—such as the nongraded school, team teaching, individually prescribed instruction, the organic curriculum, computer-assisted instruction, or Project PLAN—but they have a similar goal and that is to attempt to tailor the school and its curriculum to the individual learner rather than attempting to get the individual learner to adjust to typical classroom offerings.

A major problem confronting anyone who has tried to break up this built-in rigidity is the amount of information demanded by an individualized system. It is rather simple for the traditional teacher to keep track of what she does each day with the 30 students in her charge. Little information is required when all children progress through the same instructional materials at about the same rate, varying only in how much they learn from those exposures. When all students are on page 38 in the arithmetic text book, that single number defines where the class is. When you break up this nice neat process and allow individual students to work at different levels and rates, then you have 30 times as much information to keep track of for that same class. If you also allow students to be moving toward different objectives or toward the same objective with different modes of instruction, then the information processing problem becomes even more severe. As McLuhan recently emphasized:

> Central school computers can now help keep track of students as they move freely from one activity to another whenever moment by moment or year by year records of student progress are needed. This will wipe out even the administrative justification for schedules and regular pe-

> riods, with all their antieducational effects, and will free teachers to get on with the real business of education.[1]

Of course, McLuhan is oversimplifying slightly. As I pointed out in an earlier paper,[2] a new kind of measurement system integrated with the computer system is also needed for the necessary feedback information. That is, we need to do more than keep track of what the student has done or has been exposed to; we also need to keep track of what he has learned from those experiences. This kind of a computer measurement system has been a major missing factor in those previous efforts of individualization which have ended in failure.

One difficulty with the concept of individualization is that it means different things to different people. The critical aspect of the kind of individualization I am talking about is that lesson planning is done with and for individual students rather than for classroom groups. This does *not* mean all of the students are studying or working alone all of the time.[3]

Assuming, then, that individualized approaches to education assisted by a computer measurement system will be moving into the school during the 70's, what implications does this have for guidance? This seems to me to be a great opportunity to design a guidance program which is at the heart of an individualized educational system. Many educators would place guidance at the center of the educational process, but most schools have given only token responsibility to guidance services. Although guidance programs have often been assigned the responsibility for helping each student develop a plan for his educational and vocational future, the technology to implement such a program of individualized planning has not been developed.

Before considering the role which guidance might play in these newly emerging individualized educational systems, let us consider the current status of the guidance field. If you ask a chief school administrator to describe his guidance program, he will answer in terms of the number of professional persons officially assigned either full-time or part-time to working with individual students. In other words, to most school administrators, the guidance man is "the guy who works with individual students."

If you ask the person who is assigned this guidance task how he spends his time you will find, as did Project TALENT, that the big three time consumers are (1) counseling students regarding college plans; (2) assisting students in choosing their high school curriculum track; and (3) administering the school's testing program. If you then ask these counselors how they see their greatest contribution, the answer is in terms of helping students solve immediate choice or adjustment problems. Instead of a concern for facilitating the development of abilities, counselors are helping students make choices in terms of the abilities they now possess. Instead of a concern for modifying the school to take into account the child and adolescent personality, they are attempting to adjust them to the school as it is now. They are trying to help students solve these problems as they come along instead of developing a guidance curriculum which provides students with planning and coping skills. I want to emphasize that in characterizing guidance programs in this fashion I am not talking about the few excellent programs that exist in this country; I am talking about the other 95 percent of the schools and what is going on there.[4]

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[1] McLuhan, M., and Leonard, G. B. "The future of education," *Look* 31: 23–25, Feb. 21, 1967.

[2] Cooley, W. W. "A computer measurement system for guidance." *Harvard Educational Review* 34: 559–572, fall 1964.

[3] For a list of the basic features of an individually planned school see G. Heathers, "Checklist for assessing individualized instruction," Pittsburgh: Learning Research and Development Center (mimeographed working paper), 1968.

We could argue for the rest of the week about what guidance programs should be doing today, but that is not my main concern. The real need is trying to decide what to do to be ready for tomorrow. Let us look now at those aspects of individualized programs which will have the greatest guidance implications.

As schools individualize their instructional programs, teachers are likely to become more and more specialized in subject-matter areas in which they provide tutoring and small group instruction. The curriculum reform movements in this country today have resulted in increased teacher specialization. One guidance implication, as Cremins suggests, is that "the counselor may end up as one of the few professionals primarily responsible for seeing the child's education whole." [5]

In my view, clarifying and meeting this responsibility is the biggest task facing guidance today. It is one thing to design a school in which the student is free to move about from one educational experience to another, but what about the problem of the direction of this movement? The tests help provide the feed*back* information on where the student has been. The counselor must work with the student to provide the feed*forward* information, clarifying where the student is going.[6] To guide the student in his education he needs to relate his day-to-day educational activities to short-range and long-range goals. Goal setting and the development of plans to achieve those goals are most appropriately the responsibility of those trained in guidance.

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[4] For national data on this topic, see, for example, Flanagan, J. C., "Units, scores and norms." In *Educational Measurement* (E. F. Lindquist, editor) Washington, D.C.: American Council on Education, 1951.

[5] Cremins, L. A. The Progressive Heritage of the Guidance Movement. In *Guidance: An Examination* (Mosher, R. L., Carle, R. F., and Kehas, C. D., editors). New York: Harcourt, 1965.

[6] I. A. Richards uses this new word in "The Secret of Feedforward" *Saturday Review*, p. 14–17, Feb. 3, 1968.

This responsibility cannot be met through relying exclusively on individual or unstructured group counseling. I believe a necessary ingredient would be an extensive guidance curriculum. Through a variety of approaches—such as independent study, small group discussions, career games, and computer-assisted instruction—principles involved in goal setting, planning toward goals, self-direction, and decisionmaking need to be taught. The expected result would not necessarily be the student capable of all his own goal setting and planning. Rather, such a curriculum could provide him with a body of relevant knowledge regarding those processes so that the counselor and student can more easily work together in those tasks. The guidance curriculum must try to prepare the student to make more effective use of the counseling interview.

In an individualized school the guidance curriculum will be charged with the responsibility of helping the student develop a sense of responsibility and a competence to plan and execute his own educational program. An interesting twist here is that although some guidance philosophers have been calling for this for some time, the new kind of school will not only force the issue but will facilitate accomplishing this goal. Taking the responsibility for learning off the teacher and placing it on the learner on a day-to-day basis will facilitate the emergence of the self-directed student unlike the current dominant school organization.

Certainly as schools individualize their instructional programs, counselors will not be the only ones working with individual students. One of the unique functions of the counselor will be to see each student as a unique, developing human being. His major task will be to help each student clarify his goals and plans as a continuous process, not just in the transition from junior to senior high or from high school to college. Gone will be the problem of helping students adjust to classroom routine, but present will be an even greater challenge.

Let us take a closer look at how the computer measurement system (CMS) would support the individualized instruction process. Perhaps the closer look will clarify the implications for guidance. First of all, we need to consider the kinds of measurements needed for such a system.

There will be two general kinds of measurements, longitudinal-normative and content-standard. This distinction is important and requires explanation. The normative data are based upon the more traditional measures of individual differences from the domains of abilities and motives. Through such longitudinal efforts as Project TALENT we now can establish the major relationships existing between such a measurement base and the kinds of long-range goals students are likely to develop. In the past, normative data simply told the student how he compares with a norm group, the latter being a sample from some subpopulation of which he is a member at the time he took the test. In the CMS we are talking about structuring previously collected longitudinal data in a way that allows students to ask questions of a predictive nature, such as these: Which of my abilities do I need to strengthen in order to increase my chances of becoming a lawyer? Am I likely to earn more as an engineer if I go to College X or if I go to Institute Y? If I continue to develop my abilities at my present rate, what are my chances of being admitted to Institute Y? Given my present interests, does it look like I would be satisfied in factory work?

Good decisions require good information. Longitudinal-normative data can be the basis for improved decisionmaking regarding long-range goals and the formulation of plans to achieve them. The CMS will not make, indeed cannot make, a specific career prescription for a given student. What it can do best is display for him his multipotentialities and show him how his probabilities for career-group memberships change as his abilities and motives might change.

Although the more traditional measures of individual differences linked with followup data are useful in considering long-range goals, they are not particularly useful in making day-to-day decisions regarding appropriate educational experiences. For example, the longitudinal normative data may help the student to see that he could increase the probability of becoming an engineer if he were to improve his mathematics abilities, but this does not suggest what particular units in mathematics he should be studying today. Where a student is with respect to the mathematics curriculum is best determined through content standard or "criterion-referenced" tests.[7,8,9] Criterion referenced tests are (to continue the mathematics example) a series of tests which allows us to locate the student with respect to the available mathematics curriculum. It tells the student planner what aspects of mathematics he has already mastered and, among those he has not, which mathematics unit is most appropriately studied next. Such a criterion referenced measurement base, then, is another key component of

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[7] Glaser, R. "Instructional technology and the measurement of learning outcomes." *American Psychologist* 18: 519–521, 1963.

[8] Ebel, R. L. "Content standard test scores." *Educational and Psychological Measurement* 22: 15–25, 1962.

[9] Flanagan, J. C. "Units, scores and norms." In *Educational Measurement*, E. F. Lindquist, editor. Washington, D.C.: American Council on Education, 1951.

the information environment which is essential for a system of individualized education. It can serve as a diagnostic tool for instructional prescriptions and as the basis for the periodic evaluation of student growth.

Also stored in the computer to assist student planning is an inventory of the instructional resources available to the student. The total resources are classified into units or modules, each with a clearly specified set of objectives, each linked to the others wherever there are previously established precedence relationships among the units, and each related to the content-standard measurement battery.

The unit directions tell the student what he is to do to achieve the indicated objectives. It may include working on self-administered paper and pencil exercises, reading a book, conducting an experiment with a science kit, seeing a movie, or attending group instruction. The unit directions also tell the student what end-of-unit test he should take when he has completed the work prescribed for that unit. When this test result is available for computer processing, his next unit can be prescribed. This prescription is a function of his long-range goals, established with the counselor's aid, his degree of mastery of the completed unit, his other unit test results, and the available units and their objectives and precedent relationships.

The files in a CMS may be organized as follows. One file consists of a student's record containing such information as his current abilities and motives (for relating to longitudinal norms), content standardized placement and unit tests (summarizing his academic history to date), current unit assignments, and current short– and long–range goals. Another file contains the equations needed to relate student ability and motives to various possible goals. These equations are developed from longitudinal studies such as Project TALENT. A third file is a tree structure of the curriculum. The main branches represent the different kinds of broad goals which students might have. Branches are not necessary until differential goals become discernable, probably beginning in the late elementary grades. Another kind of branching may become possible and necessary if ever we can establish useful interactions between instructional method and individual difference variables for a given set of objectives. At the moment, at least, the only branching which seems necessary is a function of the extent to which different goals imply different curriculum emphases.

It is important to notice what is absent from the CMS as well as what is present. Gone, for example, are the teacher assigned grades. In schools today the student's class status, as judged by his teacher, is the basis for his periodic evaluation. In tomorrow's continuous progress school the concern is with a student's growth. Counselors will then be confronted with different kinds of students with different kinds of problems than they have in the past.

It is possible to design the CMS so that progress is monitored continually, alerting the counselor to possible small problems before they become big problems. Earlier I had suggested that we try to detect plateaus in the student's growth curves to indicate potential problems, but this is more difficult than it sounds.[10] A more direct and more sensitive approach is to simply keep track of when a student begins a unit and then, using rate data from other students of his ability who have worked through that unit, make an estimate of his probable completion date. If he has not finished the unit by then, a check is made to determine the probable reason. If it is an abilities problem, the specialist in that curriculum area examines his work to date and prescribes a unit or set of units which may help him to learn the necessary unit prerequisites he is finding difficult. If it is a motivational problem, the counselor may wish to review his goals with him or perhaps help him to see the relationship between the present unit and the achievement of those goals.

The school of tomorrow need not be the sole locus of the student's education. Rather it will be the place at which his education is brought into focus: (1) by a computer measurement system which provides the information environment necessary for such a system of individually planned education; (2) for the student and counselor as they assess the student's current status, immediate plans, and long-range goals; (3) for the administrators who are charged with the responsibility of administering the educational process; and (4) for the parents who are concerned about their offspring's present and future welfare.

There are many reasons why efforts toward a guidance curriculum have not been more plentiful or more successful in the past. One reason probably is the old scheduling problem. How can you talk about adding "a course in guidance" to an already overly crowded curriculum? When do you schedule small groups for the career game? During the student's only free period? It's unlikely that the chemistry teacher is going to release the student from his class! In the individualized school these kinds of questions will disappear.

I used to think that truly individually planned education would present an enormous scheduling problem. Having worked for the past few months with IPI at Pittsburgh's Learning Research and Development Center, I see that such a school organization can eliminate the scheduling problem, a problem which has become more and more complicated as school offerings have expanded. In a truly individualized school the scheduling problem disappears and a queuing problem appears in its place. This new problem is more easily solved. The typical queuing model is that of a service system in which a stream of demands appears before a service center with one, or many, servers; and either the time at which demands are made, or the service time required, or both can be described in terms of probabilities. This new arrangement makes it possible for us to consider instructional objectives which do not necessarily have to fit into any year-long or semester-long schedule. As new guidance units are devised they can be added to the total tree structure of curriculum offerings and can then be prescribed to students who need them when they need them. The administrator's problem, then, is to allocate educational resources so as to minimize queues.

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[10] Cooley, *op. cit.*

Another possible reason why a relevant guidance curriculum has not emerged to any significant degree is the fact that, for example, to teach students about career patterns implies that you know something about career patterns. To teach them how to make good decisions implies that you know how to make good decisions. To encourage student planners to consider the odds in their planning implies that the information bases for developing those probabilities are available. That kind of knowledge is now more available than before, partly because of the computer.

Lohnes, for example, has outlined a measurement basis for describing the major dimensions along which high school students differ. Together we have recently shown the ways in which these dimensions or factors are related to a variety of possible post high school goals. We have also created a career development-tree structure that spans the years from elementary school to young adulthood. The tree structure shows the kinds of patterns characterizing the careers of American youth and how factors based on the original Project TALENT battery are related to the path which a particular student follows. The result is that the student is able to see how his early decisions affect his subsequent development. He could also be given the various probabilities associated with the different possible outcomes, given his current position in this tree structure and his attributes as measured by the Project TALENT battery. The purpose of such a description of possible career patterns and their relationship to the student attributes is to provide information relevant for long-range planning. The purpose is not to identify a specific occupation toward which he then moves with great dispatch, but rather to show him how his present abilities and motives affect his probabilities of being a satisfied, successful member of various broad occupational categories. He can also, then, see that decisions he is making now about his current education affects what he will be like following that education, and that in turn affects the probabilities of achieving various long-range goals.

These projects and others are beginning to develop the research base for a new guidance curriculum for the new schools. It is an important and complex problem area. My concern is to emphasize that individualized programs may be coming faster than you think.

As we plan for the next 10 years, we must keep in mind that a lot has happened in the computer field in the last 10. The computer hardware itself has changed dramatically. Today I sit at a terminal next to my office that is on-line to a computer several blocks away. Programs are called up with simple, typed commands and operate on data stored on highspeed access computer disks. Immediate results are typed on the typewriter terminal. Ten short years ago I sat in a basement statistics lab at an IBM 650 computer console through one entire night after weeks of preparation to obtain a 19-variable discriminant analysis which now takes seconds. Prior to the computor such an analysis would not have been attempted. Today's computers are not only faster and the access more convenient, but the new software also speeds the progress of computer applications in education. For example, at the University of Pittsburgh we were able to design, write, and implement an on-line, computer-assisted laboratory course in statistical inference in a matter of months. There are now 60 students taking this course. This would not have been possible if the computer had not done most of that programing itself by using the sophisticated programing aids stored within the computer-disk memory.

Although todays computer hardware and software will make it possible for us to move very rapidly in some areas, we should also remember that there are some things which have not happened. The natural language enthusiasts had promised us foreign language translations spewing out of the computer by now but this has not happened. The information retrieval people expected that we would all have Harvard's Widener library available at our fingertips and this has not happened. We need to keep these computer successes and failures in mind as we plan future applications to education.

What has been possible in the past does not define what will be possible in the future, but the rate at which various computer applications have been implemented in the past should give us some clues as to what kinds of future implementations will be most easily and most rapidly accomplished. I believe that a computer measurement system for individually planned education will be a next big step forward, followed later by a more direct computer involvement in the actual instructional process, as soon as technology and school resources allow.

The computer measurement systems which provide the necessary feedback for managing individually planned school instruction are similar to those needed in the guidance process to develop the necessary feedforward information. It is important that guidance specialists develop the principles and the technology to implement such a CMS system and train the counselors to be competent to use it.

Finally, the computer measurement system can be employed without contradicting permissiveness and nonprescription principles so important in the counseling relationship. The CMS should actually enhance the counseling efforts to help students become better informed and responsible decision-makers.

Considerations in the Design of Automated Guidance Systems

William Godwin*

Automated guidance systems are in such an early stage of development that it would be premature to guess which features will survive as useful and which will in time be shown to be unnecessary. Given unlimited resources, the optimum strategy at this point would be to explore every technique, presentation method, and theoretical structure offering the slightest promise. The research resources in this field are limited, however, and may be even more limited in the near future. Under these circumstances it is important to allocate such available resources to areas offering the best hope of advancing the field. This suggests that automated guidance systems designers ought to question closely the need for each portion of their system, with special attention to relatively "expensive" portions.

In this context the concept of "expense" is not easily defined. Besides the obvious dollar cost for extra equipment, a project may incur "expenses" not so readily measured. They may include such items as additional system overhead, man-hours or man-years of additional programing or writing, research delays imposed by equipment problems (reliability, lead-time ordering requirements, modifications) and data interpretation problems generated by the choice of equipment and/or techniques. The problem of measuring such expenses is complicated by the fact that the "state of the art" in some fields is often an important or even a key factor. The decision to use a time-sharing computer system is a good example. Time-sharing has had a long and difficult birth. A year ago most commercially available systems which were operating at all were operating with large systems overhead, frequent failures, and serious restrictions on users. The few time-sharing computers performing at usable levels were special one-of-a-kind systems such as Project MAC and the SDC Q-32. Some early users of time-sharing—users who committed themselves to that path 3 or 4 years ago—found that they had incurred enormous expenses for extra programing and delays.

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*Associate Research Psychologist, Educational Testing Service, Princeton, N.J.

The past 12 months have seen great improvements in the quality of commercially available time-sharing systems, and presumably this improvement will continue. The possible additional "expense" of using such a system is therefore dropping, and dropping fast, and a decision to use a time-sharing computer system as a base for an automated guidance system might be relatively inexpensive for a project started 3 or 4 years ago. Here then an assessment of the state of the art is an important factor in estimating the expense of a portion of the system.

Two areas in the automated guidance systems designs are of particular concern with one common question: How much should be automated and how much should be left to an individual? This question is important in the decision as to how much, if at all, to allow a counselor to modify the system. It appears again, in a slightly different manner, in the general question of what kind of input and output to use in interacting with the student. In both, the current state of the art is a key factor, and the concern is for weighing short-term rather than long-term advantages. The balance that is sought should allow for relatively inexpensive field use in the next few years without seriously limiting the kinds of interactions being studied or the system's generality.

Counselor-Modifiable vs. Prepackaged Systems

For guidance systems in which some portion of student interaction is automated (as opposed to counselor-support systems which interact only with the counselor), one feature with some appeal is some facility for counselors to "individualize" interactions. A system using computer-presented "scripts" might allow counselors to modify the wording of some portions of standard scripts, to add special side-branches, or even to write new scripts. Roughly the same options are available to systems using written, photographic, or tape-recorded materials.

Such a facility would be appealing on a number of grounds. Counselor involvement would generally be much greater in a modifiable than in a prepackaged system, and counselor acceptance might also be better. In such a system counselor innovation might well become a major source of new techniques and improved materials. If such a system were widely available, "user's groups" might be fostered among counselors, thereby facilitating the exchange between schools not only of guidance materials, but eventually of much other information as well.

Against these virtues of a modifiable system must be weighed a number of possible evils. One is that of system overhead. This applies particularly to computer-based systems. To provide counselors with a facility for modifying programs will require some form of high-level language. If the modification facility is to be widely used, this language must be simple and foolproof, easy to learn, and relatively quick to use. To provide a language accessible only to the occasional guidance counselor/programer/innovator with lots of ideas and few other tasks to intrude on his time is unrealistic. With current staffing problems, a language requiring months to learn and weeks to write a modification is a language which will probably not be used. But generating an ideal, easy-to-learn, easy-to-use language is exceedingly difficult as writers of scientific programing languages have discovered. If the language is sufficiently simple, it simply will not handle all the important situations. If it is broad enough to encompass many operations, then it is no longer simple to learn and use. In either case, it is very likely to be inefficient at the machine-operation level relative to programer-oriented languages. The result may well be a difficult-to-learn, difficult-to-use language that is excessively expensive of machine time not only when the original modification is being written, but also every time it is being used by a student.

Aside from the system overhead problem, which is a technical one and which may eventually disappear with programing advances, there remains a very real question as to whether it will help the counselor to give him the facility to modify an automated system. Will he feel compelled to modify the system just because it is there? Will he find it more interesting to play with the system than to listen to students? Will he become subject to a kind of "modify or perish" pressure by school officials who might measure the worth of their guidance staffs by the number of scripts submitted to the user's group? To give the counselor the opportunity to make modifications may be to impose the obligation as well.

Finally, there is the question of whether or not the automated portion of a guidance system is the appropriate place for a counselor to introduce his own individual techniques. If the automated part is rote material—information on vocational or educational opportunities, for example—there is little reason for a counselor to make modifications. The better route might be to leave the modifiable portion of the guidance to the human, who is relatively inexpensive considering his enormous flexibility, and to relegate to the automated system those portions which can be, and perhaps even should be, constant for all students.

System Input and Output

A second area in which some potentially expensive decisions must be made is that of the system input and output modes. In any truly interactive (i.e., two-way) system, the human and the system must communicate in some common language, typically a compromise between the "natural languages" of the human and the system. Essentially the question is one of where to place the compromise. Shall the human talk to the system at some "mechanical" level, or shall the system attempt to adapt to the peculiarities of human communication? This again is an area greatly influenced by the state of the art in a number of fields, and for the most part this art is relatively primitive. Natural language processing is proving to be a difficult and expensive process; cathode ray tube (CRT) output and keyboard and light pen input are about the best currently available modes of communicating in real time with computers; and audio input systems are still laboratory curiosities.

There is general agreement that the teletype keyboard is an unsatisfactory input device, being perhaps only slightly better than a row of multiple-choice push buttons, and that output messages typed at 10 characters per second or so are less than ideal. Again, this is an expensive route, and perhaps not the most profitable one for investigators who hope to put systems into the field in the near future.

By analogy, suppose the telephone system still ran with human operators in place of dial systems. If someone now proposed that each phone be equipped with a 10-digit dial, and that to call someone else one must dial, in the proper order, an 11-digit sequence, the protests would be predictable. "People will surely often make errors in dialing 11 digits, and then they will get the wrong number, something that never—well, hardly ever—happened with a human operator." "Dialing will be a distraction." "Some people will be unable to dial, or even recall telephone numbers." These are all true observations, yet we have adapted to the dial phone and adapted remarkably well.

The point is that it may be better at our current stage of development to require the human to adapt to the system's limitations than to try to adapt the system to the human. "Natural" input and output to the human is expensive with present technology, and even the best that can now be achieved leaves much to be desired. A better allocation of resources for the short term may be to explore ways in which relatively simple and inexpensive input and output devices can be made more flexible, perhaps by pretraining the student or by allowing the student to make free responses and then asking that he himself encode them into some form acceptable to the system.

Requiring that the student himself encode his responses may even prove to have advantages. Whatever method is used, free or partially free responses will eventually have to be encoded, either by the system or by a human. If the encoding is done by the subject who emitted the response, the chances are better that the intended meaning will be encoded, rather than simply the expressed meaning. Moreover, requiring a subject to redefine and categorize his responses might be a useful means of helping him to crystallize his ideas.

Parallel arguments exist for system output. Animated color CRT displays would be nice, and we can all think of marvelous uses for them, but a typed message, a slide, or even a mimeographed sheet might do the job almost as well. One of the present concerns in this area is the storage and retrieval of text in automated systems. Variable text, emitted in response to and conditional on a subject's previous behavior and record, may be a necessary part of the system. Large bodies of fixed text, however, might be better stored in some way which uses the subject himself as the retrieval system, thereby reducing system cost and perhaps teaching good library habits as well. Some ingenuity may be required to ensure that he selects the material he is supposed to, but the total expense may still be less than for alternative systems.

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These comments are not intended to suggest that the simplest and least expensive way is the best, or that all newfangled devices are to be avoided. Some systems will require elaborate and expensive components for which there is no cheap substitute. However, it has been suggested that complexity and expense are very real factors in this area and that they ought to be weighed heavily in considering alternatives. Schools often operate with limited budgets, budgets which will not support excessively expensive systems. Nor is the financial picture likely to improve in the near future. To produce an automated guidance system, however magnificent, which is beyond the reach of most schools is surely no help to the average guidance counselor. To produce a system which schools can barely afford by draining funds and manpower from other critical areas imposes on us the obligation to be certain that their funds are as well spent as possible, and that the system carries no unnecessary luxuries.

Getting a Guidance Machine to Understand English

Allan B. Ellis, Margaret E. Pincus, Patricia Yee*

A central purpose of the project called ISVD—which stands for the Information System for Vocational Decisions—is to create an environment which fosters the decision process. The kind of deciding that we care most about is vocational, and it is quite natural, therefore, that at the base of ISVD is the theory proposed by David Tiedeman and Robert O'Hara concerning the career decisionmaking process.[1] Underlying this theory is the idea that a student's decisions about a career, to be good, must be made in the context of his life span rather than in isolation. A person who takes choice points as they come, making a vocational choice here and another one there, runs the risk of stringing together decisions that are poorly related and often contradictory. When decisions are made after considering both future possibilities and the strengths and weaknesses of past choices, then today's decision has meaning in terms of today's problems and also reflects a sense of continuity. In ISVD we assert that the best way to foster this sense of continuity in an individual, and along with it a sense that he can have considerable effect upon what happens to him in the future, is to create for him a setting for career decisionmaking.

Some of us call this setting a "reckoning environment" because we want students to do more than just make up their minds. We want them to figure up, measure, estimate, compare, judge, make calculated guesses, and in the end take responsibility for their decisions. This is what deciding means, but often people equate decisionmaking with choicemaking and thereby miss the inherent notion of the process and its extension over time. What is left, usually, is the mistaken idea that a person decides by making up his mind, and thus we hear about the moment of decision as though it all happens at a point in time which is discrete and unbounded by thought and reflection. To make if clear that it is precisely this misconception and the resulting inflexibility we wish to challenge in ISVD, we have come to refer to the setting for vocational decisionmaking which we are creating as a vocational reckoning environment.

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*Dr. Ellis is an Assistant Professor of Education at Harvard Graduate School of Education. Miss Pincus and Miss Yee are Research Assistants.

[1] Tiedeman, D. V. and O'Hara, R. P. *Career Development: Choice and Adjustment.* College Entrance Examination Board, New York, 1963.

Along with the student himself there are two additional components within the ISVD reckoning environment. The first is an extensive collection of data about the world of work. Facts about jobs, colleges, trade schools, military specialties, and about the student himself are just a few of the data types to be stored and made available to him. These data are organized into five major data files: occupational, military, educational, personal and family living, and student characteristics. Naturally, while each file is separate from the other, all of them reference each other so that a student may follow a question through all its aspects.

An important point which ISVD wants the student to realize is that, in the real world, data are never complete. Often it is precisely this data incompleteness about the world of work that makes decisions necessary. Thus, before one begins the decisionmaking process, he must understand the incompleteness of the data with which he is dealing. This is explained in the following:

> Accepting data on these terms . . . one is more likely to take responsibility for the choices he makes, since they are not totally determined by external factors. If they are, then choice would be either irrelevant or superfluous. Furthermore, in order to create information on which to base a decision, one must *actively* process data rather passively be guided by them, and therefore, the student must become a significant agent in the choice process. That is, the incompleteness of data implies that the individual is responsible for his decisions in both meanings of the word: he is the one who makes the decisions, not someone or something external to him; he is the one who enjoys or suffers the consequences. This is one way to define 'freedom' and it is to this notion that the project is dedicated. It will achieve this goal by developing in the student the ability to engage in this kind of decisionmaking relative to his career choice. That is, the project will place the student among resources, enhance his access to them, teach him the stages in decisionmaking, and have him engage the resources in a controlled setting so that he can develop the skills of processing data and making decisions.[2]

The result we hope for is that by developing these skills the student will cultivate in himself a "sense of agency," that is, the belief that he is the significant agent in determining what happens to him.

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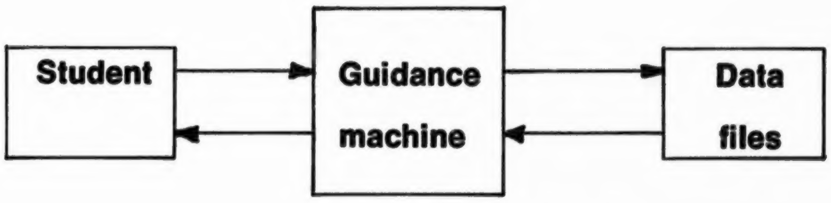
[2] Ellis, A. B., and Wetherell, C. S. "The Computer and Career Decisions" Technical Memorandum I, Harvard-NEEDS-Newton Information System for Vocational Decisions. Cambridge, Mass. September 1966.

Between the student and the data we intend to place a guidance machine. The function of this third and final element of the ISVD reckoning environment is to facilitate student access to data and vice versa. That is, not only do we wish to provide a means for the student to gain convenient access to data, but we wish to keep track of such access as well. In this way, not only can an individual get the facts with which to make decisions, but he can also gain a sense of the way he goes about making decisions.

One way, then, to describe the vocational reckoning environment of ISVD is shown in this diagram.



Now, since there is no such thing as a guidance machine, the major task of ISVD, is to build one. Instead of building this machine in the usual way with pliers and screwdrivers, however, ISVD is transforming a computer into a guidance machine and this paper is a progress report on one aspect of this not inconsiderable task.

This is not an unnatural task since computers are made for this sort of thing. What most people call a computer program is in fact an explicit statement of a procedure, and at the same time a description of the machine needed to perform that procedure. This is a behavioral description, but it is all that a computer needs to imitate the machine so described. It is the purpose of ISVD, therefore, to create a sufficiently explicit description of the guidance machine's behavior so that a computer can "behave" as though it were that machine.

Our efforts to describe a guidance machine fall into two categories. The first is the development of "necessary evil" software consisting of a fairly elaborate set of computer programs for performing certain basic and generally required functions. We need, for example, to operate in a time-shared setting so that more than one student can use the system at any one time. Furthermore, we must be able to create, maintain, edit, and retrieve data files. A programing language to allow both string manipulation and list processing, programs for statistical analyses, routines to permit content analysis, and the general facility of keeping track of who is on the system and what needs to be done next are some other examples of this "necessary evil" computer software.

The second category, and perhaps the more interesting one, is the development of ISVD software. These are the programs that enable our time-shared computer to behave like a guidance machine, and it is here that any substantive contributions of ISVD rest. The single, most significant component of the ISVD software is that network of routines we call "scripts." Not unlike the manuscript of a play (from which it gets its name) a script is a set of rules describing how the guidance machine is to act. These scripts may contain items such as the text to be presented to a student either by a video display device or a printer, commands to activate a tape recorder or motion picture projector or to display a 35mm slide, instructions for how to process the student's responses, and rules for any computation or storage or retrieval of data.

The major feature of scripts must be the ability to allow what appears to be conversation between an individual and the guidance machine, because so much of the deciding process consists of unstructured behavior, such as browsing through data files. Thus, the student must be free enough to generate his own questions in as natural a form as possible. We have spent some time in exploring the problem of getting a computer to seem to understand and to respond to English questions posed by the student. The progress we have made is reported here.

A number of efforts in recent years have been made to get computers to deal with English sentences. Among these the works of Simmons,[3] Helm,[4] Bobrow,[5] Stone,[6] and Green[7] are especially relevant to ISVD. Although we have been examining these carefully to determine how we might benefit from them, this paper will confine itself to only one such examination, that of adapting our needs to the computer program called ELIZA developed by Joseph Weizenbaum of the Massachusetts Institute of Technology.[8,9,10]

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[3] Simmons, R. F. "Synthex: Toward Computer Synthesis of Human Language Behavior." In *Computer Applications in the Behavioral Sciences*, H. Borko, editor, Englewood Cliffs, N.J.: Prentice-Hall, 1962, pp. 360-393.

[4] Helm, C. E. *Simulation Models for Psychometric Theories.* Princeton University, November 1965.

[5] Bobrow, D. G. "A Question Answerer for Algebra Word Problems." Memo, 45, Artificial Intelligence Project, Cambridge, Mass., MIT, 1963.

[6] Stone, P. J., Dunphy, D. C., Smith, M. S., and Ogilvie, D. M. *The General Inquirer: A Computer System for the Analysis of Text.* Cambridge, Mass: Massachusetts Institute of Technology Press, 1966.

[7] Green, B. F., Chomsky, C Laughery, K., and Wolf, A. K. "Baseball: An Automatic Question-Answerer." In *Proceedings of the Western Joint Computer Conference.* Vol. 19, New York: WJCC, 1961. pp. 219–224. Reprinted in Feigenbaum and Feldman (1963), 207–216.

Although ELIZA is a computer program, it is convenient to think of it more as a scriptwriting language in which an author specifies certain kinds of natural language conversations between man and machine. The ELIZA program accepts, as input, scripts describing the nature of the desired interaction. It is the job of the main program to process these scripts.

An ELIZA script is divided into two parts: a keyword section and a program section. The keyword section contains keywords and decomposition and reassembly rules. The keywords provide some hint as to what the student is talking about while decomposition rules provide a way to analyze his sentence to determine what he is saying.[11] The reassembly rules describe how the program is to respond to the student's input, while the program part of the script contains further details of what is to be done when there is a match between a decomposition rule and an "inputted" sentence.

Specifying keywords is particularly important in ELIZA and entails not only constructing a relevant set of such words but also requires a concern for their position in an input sentence. Consider, for example, one possible response to the question. WHAT WOULD YOU LIKE TO DO TODAY?

I want to play the game of baseball with you.

This sentence matches the decomposition rule:

(0 (*play take use see try) 0 game 0)

(Meaning: any number of words, including no words at all, followed by one of the words in parentheses, followed by any number of words, followed by the word 'game,' followed by any number of words.)

GAME is an important keyword in this script since it connotes an important part of the ISVD system. In the above example the machine has "recognized" the fact that the student would like to play a game, but it does not know which one since the word baseball was not picked up. The decomposition rule is very general and will probably match many different inputted sentences. Since this is the case, it must transfer control to a general statement which says:

WITHIN THE ISVD SYSTEM THERE ARE ONLY TWO KINDS OF GAMES THAT YOU CAN PLAY. ONE IS CALLED THE LIFE CAREER GAME AND ONE IS A RISK TAKING GAME.
WHICH ONE DO YOU WANT?

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[8] Weizenbaum, J. "Symetric List Processor." Communications of the Association for Computing Machinery, Vol. 6, September 1963, pp. 524–544.

[9] ———"ELIZA-A Computer Program for the Study of Natural Language." Communications of the ACM, Vol. 9, No. 1, January 1966, pp. 36–45.

[10] ———. "Contextual Understanding by Computer." Communications of the ACM, Vol. 10, No. 8, August 1967, pp. 474–480.

[11] Taylor, E. F. The ELIZA Program: Conversational Tutorial, 1967. Institute of Electrical and Electronics Engineers. International Convention Record, Vol. 6, part 10, pp. 8–15.

Rather tactfully, it reminds the student that in order "to play" the system he must stay within its context. Now consider the following:

I WANT TO PLAY THE LIFE CAREER GAME

The above decomposition rule would match this input as well but the response would be inappropriate. So we must make a more specific rule:

```
(0 (*play take use see try) 0 life career game 0)
```

and the transfer is directly to the game.

However, what if the student had said:

I CERTAINLY DO NOT WANT TO PLAY THE LIFE CAREER GAME

This sentence would match the above decomposition rule and transfer directly to the game, which would be an inappropriate response. So we must provide another decomposition rule that would provide for the negative:

```
(0 not (*play take use see try) 0 life career game 0)
```

Obviously then, the only way that we could be absolutely sure that the machine would understand what the inquirer is saying is to specify all the alternative decomposition rules with a particular keyword—an almost impossible task! How many ways can you use the word 'game' in a sentence? How many and what words could possibly precede and follow it? The best we can do is to create our decomposition rules based on a confidence level of expected student response.

In an ELIZA script, decomposition rules are listed in order of generality, the most specific listed first, and so on. The following is an example of the keyword section in our ORIENTATION script for the word 'game', specifically the rules of play:

```
(game(game(       —specification of keyword
(0 how 0 (*play take use see try) 0 risk 0 game 0) () aaa
(0 how 0 (*play take use see try) 0 life career game 0) () bb
(0 rules 0 life career game 0) () bb
(0 rules 0 risk game 0) () aaa
(0 rules 0 game) (which game are you interested in,) o
DECOMPOSITION     REASSEMBLY     TRANSFER POINT TO
                                 PROGRAM SECTION
```

Aside from keywords, decomposition and recomposition rules, ELIZA operates on several other powerful mechanisms. The first of these is called a DLIST. This function allows the scriptwriter to tag certain words as belonging to a particular category. Consider the following:

```
(MOTHER DLIST (/FAMILY))
(FATHER DLIST (/FAMILY))
(BROTHER DLIST (/FAMILY))
(SISTER DLIST (/FAMILY))
```

Mother, father, brother, and sister are all tagged family. This saves considerable time in decomposition rules. Instead of specifying a decomposition rule for each word, the scriptwriter can do the following:

```
(0 LOVE 0 (/FAMIILY) 0)
```

which means: match an inputted sentence that has any number of words, followed by the word LOVE, followed by any number of words, followed by any word tagged FAMILY, followed by any number of words.

Now a reassembly rule would allow the computer to come back with an appropriate response:

```
(0 LOVE (/FAMILY) 0) (WHY DO YOU LOVE YOUR 4.)
```

The 4 refers to the fourth element in the decomposition rule. In this case, the word tagged family. A conversation could go like this.

S: I LOVE MY MOTHER.
C: WHY DO YOU LOVE YOUR MOTHER.
S: BECAUSE SHE'S NICE TO ME.
C: DO ANY OTHER REASONS COME TO MIND.

(This response is triggered by the word "because".)

Another important mechanism is the ability to make substitutions in the student's input and then apply decomposition rules to the revised input. For instance, some of the substitutions that we made were:

```
(OF COURSE=YES.)
(YEAH=YES.)
(NATURALLY=YES.)
(RIGHT=YES.)
```

What happens then is that any time 'of course', 'yeah', 'naturally', or 'right' occur in the input, the computer substitutes the word 'YES'. If we are looking for a YES response from the user and he types in any of the above, his input would then be treated as a YES.

A third mechanism is known as the table mechanism. This is powerful because it keeps track of the context of the conversation. It is used when there is the possibility of several different user responses, each of which refers to a previous context. For instance, a user might answer a question YES, NO, or UNSURE. In the keyword section of the script we have the following:

```
(0 YES 0 DLIST (YYY))
(0 NO 0 DLIST (NNN))
(0 (/UNSURE) 0 DLIST (ZZZ))
```

Each decomposition rule is given a tag; the first is tagged (YYY), the second (NNN), the third (ZZZ).

In the program section following the question, is the table

```
*A TYPE ('DO YOU LIKE TO PLAY GAMES.'), NEWTOP
('(YYY AA NNN AB ZZZ AC O'E M), TABLE).
```

The instructions to the computer goes as follows:

TYPE the sentence 'DO YOU LIKE TO PLAY GAMES'. If he answers 'yes' go to the label (another piece of text usually) AA; if he answers 'no' go to the label AB; if he answers a word tagged 'unsure' go to the label AC; otherwise (O'E) go to the label M. STOP, wait for input (indicated by the period following the last parenthesis.)

Another important feature of ELIZA is the ability of one script to call into play another script, to switch control and to return to the main script when that level of conversation has been terminated. We made heavy use of this ability.

For a more complete description of ELIZA, refer to the work of Taylor,[12] and Hayward.[13]

Stated simply, our task was to experiment with ELIZA in order to demonstrate its usefulness to the ISVD. We think that we have accomplished this task in the writing of demonstration scripts for the Access Routines of EXPLORATION and CLARIFICATION and the ISVD ORIENTATION.

An access routine is a set of scripts that allow an inquirer access to various scripts, procedures, and to one or more of the system's several data files. In the ISVD, they are named *exploration, clarification* and *review* in an effort to use names close to the conditions in the Tiedeman-O'Hara paradigm of decisionmaking.

Our scripts, therefore, are inherently different from those developed elsewhere in that they serve as calling (access) scripts or as data collection scripts. The purpose of a calling script is to ascertain what the inquirer (i.e. user) wants to do: does he want to access the occupation data base, play the Life Career Game, developed by Sarane Boocock,[14] or think about which colleges to apply to? After the script has determined what it is that the inquirer wants, it calls in the appropriate materials.

A data collection script, on the other hand, asks for specific information from the inquirer (e.g. what factors are important to you in thinking about college choice?), then analyzes the information and stores it for later use in the system.

In the demonstration ELIZA script system, the ORIENTATION script is used as the main calling script. The keywords in this script refer to our three primary data files (occupations, military, and education), and to the Life Career Game.

An inquirer as he goes through the ISVD orientation script may or may not know what he wants to do in the system. If the latter is the case, control is transferred to a script designed to help him choose an activity by checking his personal data file for suggestions.

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[12] Taylor, *op. cit.*

[13] Hayward, P. R. ELIZA Scriptwriter's Manual. Education Research Center, Massachusetts Institute of Technology: Cambridge, Mass. March 1968.

[14] Boocock, S.S. "The Life Career Game. "*The Personnel and Guidance Journal,* Vol. 46, 4, 328–334.

In the following example the computer's output is upper case, and the student's input is in upper and lower case.

> WHAT WOULD YOU LIKE TO DO TODAY?
> I don't know.
> HAVE YOU THOUGHT ABOUT WHAT COURSES YOU ARE GOING TO TAKE NEXT YEAR?
> Yes.
> WOULD YOU LIKE TO EXPLORE THAT FURTHER NOW?
> No.
> WELL, HAVE YOU THOUGHT ABOUT WHAT YOU WOULD LIKE TO DO AFTER YOU GRADUATE FROM HIGH SCHOOL?
> Yes I want to go to college.
> WOULD YOU LIKE TO TALK ABOUT COLLEGE CHOICE?
> O.K.
> FINE. SINCE WE KNOW THAT YOU HAVE NOT EXPLORED YOUR COLLEGE CHOICE WITH THE SYSTEM BEFORE, THE FIRST THING WE WOULD LIKE TO FIND OUT IS IF YOU HAVE THOUGHT ABOUT THIS CHOICE ENOUGH TO HAVE SOME ALTERNATIVES IN MIND. IF YOU DO, TYPE THE NAMES OF EACH OF THE ALTERNATIVE COLLEGES. IF NOT, TYPE IN THE WORD NO.

After an activity has been selected (in this case, college choice) control is transferred to one of the access routine's scripts.

If we think of the ISVD as a network of scripts, then the student is given a choice of three different kinds of scripts:

(1) he can declare himself ignorant of vocationally relevant concepts and thereby gain access to concept teaching scripts;

(2) if he realizes that future decisions affect his life (plan, style, etc.) and he wants to find out how, he can elect scripts for practice (such as the game);

(3) if he wants to play the game for real, using his own data and applying 1 and 2, he can gain access to the decisionmaking access routines *(exploration, clarification, and review).*

In the Tiedeman-O'Hara decisionmaking paradigm, the purpose of exploration is to generate alternatives. Activity is to be planned so that alternatives are selected and so that preferences start to form.[15] After an inquirer has explored any number of alternatives, crystallization should produce preferred alternatives and the bases on which those alternatives are favored. The purpose of the *clarification* access routine is to test how strongly the individual maintains his commitment. Major activities in the routine are those that determine if the bases for crystallization and choice do in fact exist and that the individual is aware of them, and also those activities that determine if these bases are realistically sound or too inhibitive.

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[15] Tiedeman, D. V. Memorandum to ISVD Staff. "Beginning amplification of Access Routines EXPLORATION and CLARIFICATION," Oct. 16, 1967.

The access routines must allow an inquirer to vacillate between *exploration* and *clarification* when an "alternative comes to mind, is only partially pursued, is argumented by another alternative which in turn is only partially pursued, and . . . the repetition of these pursuits somehow gives rise to the formation of a superordinate structure in which you can see crystallization and evoke the belief that one has chosen." [16]

Since our intention was first to create a demonstration of ELIZA's capabilities, we did not complete all the scripts that these access routines require. We feel satisfied, nonetheless, that the capabilities of ELIZA will allow us to come close to reflecting the Tiedeman-O'Hara paradigm of decisionmaking.

The following extended example of a student's interaction with the ISVD *exploration* and *clarification* scripts will serve to indicate the ways in which ELIZA is being applied to our problem. We provide such a lengthy example to suggest not only the capabilities of our demonstration system but also to provide a sense of the kind of flexibility we wish to offer the student.

WHAT WOULD YOU LIKE TO DO TODAY.

I want to think about colleges to apply to next year.

SINCE WE KNOW THAT YOU HAVE NOT EXPLORED YOUR COLLEGE CHOICE WITH THE SYSTEM BEFORE, THE FIRST THING WE WOULD LIKE TO FIND OUT IS IF YOU HAVE THOUGHT ABOUT THIS CHOICE ENOUGH TO HAVE SOME ALTERNATIVES IN MIND. IF YOU DO, TYPE THE NAMES OF EACH OF THE ALTERNATIVE COLLEGES. IF NOT, TYPE IN THE WORD NO.

Harvard University, Boston College, and Berkeley.

GOOD.
WHAT KINDS OF THINGS DID YOU DO IN EXPLORING COLLEGE CHOICE. DID YOU READ ANY COLLEGE CATALOGS OR TALK WITH YOUR GUIDANCE COUNSELOR. MAKE AS COMPLETE A STATEMENT AS POSSIBLE.

I read the catalog for Harvard and Boston College. I talked to my guidance counselor, and had a couple of interviews with the Dean at Harvard. My father went to Berkeley so that's why I'm interested in going there.

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[16] *Ibid.*

THESE ARE THE ACTIVITIES THE MACHINE HAS RECOGNIZED OR ANALYZED FROM YOUR STATEMENT. YOU HAVE DISCUSSED THE MATTER WITH MEMBERS OF THE FAMILY, SPOKEN WITH A GUIDANCE COUNSELOR, READ SOME COLLEGE CATALOGS, SPOKEN WITH COLLEGE OFFICIALS. HERE ARE SOME OTHER THINGS THAT MAY BE A GOOD IDEA TO DO IF YOU HAVEN'T ALREADY. YOU COULD HAVE DISCUSSED THE MATTER WITH A TEACHER. NOW THEN, LOOK AT THE LIST OF EXPLORATION ACTIVITIES THAT YOU PERFORMED OUTSIDE OF THE SYSTEM. HERE IS THE LIST OF YOUR PRESENT ALTERNATIVES.
HARVARD UNIVERSITY, BOSTON COLLEGE, AND BERKELEY.
NOW TYPE IN THE ACTIVITIES THAT YOU FEEL HELPED YOU MOST IN MAKING UP YOUR MIND OR GAVE YOU SOME ALTERNATIVE COLLEGES TO THINK ABOUT. PLEASE TYPE THEM IN ORDER OF IMPORTANCE.

The interviews and talking with my Dad.

GOOD. BEFORE WE GO ON TO EXPLORE COLLEGE CHOICE, WHAT ARE THE FACTORS THAT YOU THINK ARE IMPORTANT IN CONSIDERING WHICH COLLEGES TO APPLY TO.

Grades, class, rank.

ANYTHING ELSE.

Tuition costs, test scores.

HERE ARE SOME OF THE FACTORS THAT OTHER STUDENTS FOUND IMPORTANT (1) CURRICULUM CHOICE (2) COURSE SELECTION (HIGH SCHOOL SUBJECTS) (3) GRADES (4) CLASS RANK (5) TEST SCORES (PSAT, SAT, CEEB, ACT) (6) EXTRA-CURRICULAR ACTIVITIES (7) FUTURE VOCATIONAL PLANS (8) GOAL IN GOING TO COLLEGE (9) POST COLLEGE EDUCATION AND/OR TRAINING.
HERE IS YOUR LIST.
GRADES, CLASS RANK, TUITION COSTS, TEST SCORES.
LOOK AT BOTH LISTS AND THEN TYPE IN ALL THE FACTORS FROM BOTH LISTS THAT YOU CONSIDER IMPORTANT IN THINKING ABOUT COLLEGE CHOICE.

High school courses, grades, class rank, test scores, tuition costs, future vocational plans.

FINE. THERE ARE SEVERAL WAYS THAT YOU CAN GO ABOUT THINKING ABOUT COLLEGE CHOICE WITHIN THE ISVD SYSTEM.
YOU CAN GO THROUGH SOME CONCEPT SCRIPTS WHICH ARE DESIGNED TO GIVE YOU SOME FACTS ON TOPICS RELEVANT TO COLLEGE CHOICE. OR YOU CAN PLAY THE LIFE CAREER GAME. USING THE DATA OF A MAKE BELIEVE STUDENT WHO IS LIKE YOU IN SOME WAYS YOU

GO THROUGH THE PROCESS OF SELECTING A COLLEGE FOR HIM. IF YOU HAVE SPECIFIC COLLEGES IN MIND, YOU CAN GET DATA ON THEM BY ACCESSING THE EDUCATION DATA FILE.
IF YOU LIKE, YOU CAN LET THE SYSTEM GUIDE YOU THROUGH A STATEMENT OF PREFERENCES TO COME UP WITH A LIST OF COLLEGES THAT MOST NEARLY MATCHES YOUR PREFERENCES. OR YOU CAN ELECT TO FIRST GO THROUGH A UNIT ON DECISIONMAKING, A UNIT THAT TRIES TO HELP YOU UNDERSTAND YOURSELF AND OTHERS IN RELATION TO MAKING DECISIONS.
WHAT WOULD YOU LIKE TO DO.

Access the education data file.

YOU HAVE ACCESSED THE EDUCATION DATA FILE. FOR DEMONSTRATION PURPOSES ONLY, THE FOLLOWING SCHOOLS HAVE BEEN IMPLEMENTED. HARVARD COLLEGE (MEN), GOUCHER COLLEGE (WOMEN), BERKELEY UNIVERSITY (LARGE STATE SUPPORTED SCHOOL), BOSTON COLLEGE (RELIGIOUSLY AFFILIATED), AND CARNEGIE INSTITUTE (TECHNICAL TRAINING SCHOOL).
THE FOLLOWING FOUR VARIABLES HAVE BEEN IMPLEMENTED . . . COSTS (INCLUDING TUITION, ROOM AND BOARD, AND OTHER FEES), REQUIRED ENTRANCE EXAMS, CRITERIA USED IN SELECTING STUDENTS AND REQUIRED HIGH SCHOOL COURSES.
NOW THEN, YOU CAN QUERY THIS MICRO DATA BASE IN ANY WAY THAT YOU WANT. PLEASE DO NOT USE QUESTION MARKS. IF YOU WISH TO STOP AT ANY TIME, TYPE IN THE WORD STOP.
YOU MAY BEGIN.

How much does it cost to go to Harvard.

TUITION AT HARVARD IS 2000 PER YEAR INCLUDING LAB AND HEALTH FEES. ROOM AND BOARD IS 1170 DOLLARS. NON-RESIDENT STUDENT FEE IS 25 DOLLARS. BOOKS AND SUPPLIES ABOUT 70 PER YEAR. PERSONAL EXPENSES ABOUT 375 DOLLARS INCLUDING ROOM SUPPLIES, CLOTHING, LAUNDRY AND CLEANING, RECREATION, AND OTHER PERSONAL EXPENSES (EXCEPT TRAVEL).
How does that compare with Boston College.
BOSTON COLLEGE'S TUITION IS 1600, ROOM AND BOARD IS 1050 DOLLARS. OTHER COSTS INCLUDE BOOKS AND SUPPLIES ABOUT 100 DOLLARS, LAB FEE 100 DOLLARS AND 30 DOLLARS FOR WOMEN BOARDING STUDENTS FOR HEALTH FEES.

What high school courses should I take for Boston College.

NO SPECIFIC NUMBER OF UNITS IS REQUIRED HOWEVER THE FOLLOWING MINIMUM IS REQUIRED. . ENGLISH(4), ALGEBRA(2), PLANE GEOMETRY(1), FOREIGN LANGUAGE (2), TRIGONOMETRY (FOR STUDENTS PLANNING TO MAJOR IN MATH, BIOLOGY, CHEMISTRY OR PHYSICS(2), FOR STUDENTS PLANNING TO MAJOR IN THE ABOVE SCIENCES AND FOR APPLICANTS TO SCHOOL OF NURSING), ACADEMIC ELECTIVES(5).

What specific entrance exams are required.

BOSTON COLLEGE REQUIRES THE SAT AND THREE ACHIEVEMENT TESTS. ENGLISH, LEVEL I OR II, MATHEMATICS, AND ONE OF THE CANDIDATE'S CHOICE.

Does Berkeley require the SAT.

APPLICANTS WHO ARE INELIGIBLE, DUE TO GRADE AVERAGE, OR TO UNIT OR DISTRIBUTION DEFICIENCIES, OR WHO HAVE GRADUATED FROM AN UNACCREDITED SECONDARY SCHOOL, MAY QUALIFY FOR ADMISSION BY CEEB EXAMINATIONS. THE THREE ACHIEVEMENT TESTS REQUIRED FOR THOSE APPLYING FOR ADMISSION ARE:
ENGLISH, ONE TEST IN SOCIAL STUDIES OR FOREIGN LANGUAGE, ONE TEST IN MATHEMATICS OR A SCIENCE. REQUIREMENTS FOR CALIFORNIA RESIDENTS. . TOTAL SAT SCORE OF AT LEAST 1000, AND TOTAL SCORE ON THREE ACH OR AT LEAST 1650 WITH NO SINGLE ACH LESS THAN 500.0 REQUIREMENTS FOR OUT-OF-STATE RESIDENTS. . TOTAL SAT SCORE OF AT LEAST 1100 AND TOTAL SCORE ON THREE ACH OF AT LEAST 1725.0

What are the costs there.

TUITION AT BERKELEY IS 980 DOLLARS PER YEAR OF THREE QUARTERS FOR OUT-OF-STATE STUDENTS. NO TUITION FOR CALIFORNIA RESIDENTS. ROOM AND BOARD VARIES BETWEEN 600 AND 940 DOLLARS. INCIDENTAL FEE OF 242 DOLLARS. ASSOCIATED STUDENTS MEMBERSHIP FEE 11 DOLLARS. BOOKS AND SUPPLIES ABOUT 80 to 110 DOLLARS.

How do they choose their students.

BERKELEY SELECTS ITS CANDIDATES ON THE BASIS OF A CANDIDATE'S SECONDARY SCHOOL RECORD AND CEEB SCORES. ALUMNI RELATIONSHIP AND GEOGRAPHICAL DISTRIBUTION NOT RELEVANT.
HARVARD CHOOSES ITS CANDIDATES ON THE FOLLOWING CRITERIA. SECONDARY SCHOOL RECORD, SCHOOL'S RECOMMENDATION, AND CEEB SCORES. ALSO, CHARACTER, PERSONALITY AND EXTRACURRICULAR PARTICIPATION

ARE STRONGLY EMPHASIZED. SPECIAL TALENTS AND INTERESTS ALSO CONSIDERED.

How much does it cost to go to Goucher.

THERE IS A COMPREHENSIVE FEE OF 2950 DOLLARS PER YEAR INCLUDING TUITION, ROOM AND BOARD, AND LAB FEES. STUDENT ACTIVITY FEE OF 13 DOLLARS, HEALTH FEE 50 DOLLARS, AND GYMNASIUM OUTFIT 27 DOLLARS. OTHER COSTS INCLUDE BOOKS AND SUPPLIES ABOUT 100 DOLLARS.

What kinds of courses should I take.

16 UNITS REQUIRED, THE FOLLOWING RECOMMENDED . . . ENGLISH (4), MATHEMATICS (3), 2 IN ALGEBRA, 1 IN GEOMETRY, ONE FOREIGN LANGUAGE (3), HISTORY (2), LABORATORY SCIENCE (1). THE COMMITTEE ON ADMISSIONS MAY ALLOW ENTRANCE CREDIT FOR WORK IN ELECTIVE SUBJECTS NOT LISTED.

How do they pick their students.

GOUCHER COLLEGE BASES ITS CANDIDATE SELECTION ON THE SECONDARY SCHOOL RECORD, THE SCHOOL'S RECOMMENDATION, AND TEST SCORES. OTHER IMPORTANT FACTORS ARE PERSONAL CHARACTERISTICS, EXTRACURRICULAR PARTICIPATION, AND INDIVIDUAL INTERESTS. ALUMNAE RELATIONSHIPS AND GEOGRAPHICAL DISTRIBUTION CONSIDERED.

I think that I would like to stop now.

WOULD YOU LIKE A SUMMARY OF YOUR EXPLORATION OF THE EDUCATION DATA FILE.

Yes.

FINE.

YOU GOT DATA ON THE FOLLOWING VARIABLES FOR HARVARD COLLEGE. . COSTS, INCLUDING TUITION AND ROOM AND BOARD, HOW THE SCHOOL SELECTS ITS STUDENTS.

FOR BOSTON COLLEGE YOU GOT DATA ON THE FOLLOWING VARIABLES. . COSTS, INCLUDING TUITION AND ROOM AND BOARD, WHAT HIGH SCHOOL COURSES ARE RECOMMENDED OR REQUIRED FOR ENTRANCE, WHAT ADMISSION TESTS YOU SHOULD TAKE.

YOU HAVE FOUND OUT ABOUT

WHAT ADMISSIONS TESTS YOU SHOULD TAKE, COSTS, INCLUDING TUITION AND ROOM AND BOARD, HOW THE SCHOOL SELECTS ITS STUDENTS, FOR THE UNIVERSITY OF CALIFORNIA AT BERKELEY.

FOR GOUCHER COLLEGE YOU EXPLORED THE DATA ON THE FOLLOWING VARIABLES. . COSTS, INCLUDING TUITION

AND ROOM AND BOARD, WHAT HIGH SCHOOL COURSES ARE RECOMMENDED OR REQUIRED FOR ENTRANCE, HOW THE SCHOOL SELECTS ITS STUDENTS.
YOU DIDN'T EXPLORE THE AVAILABLE DATA ON CARNEGIE INSTITUTE.
NOW THEN. WOULD YOU LIKE TO GO BACK AND FIND OUT ANYTHING MORE ABOUT THESE SCHOOLS.

No.

WOULD YOU LIKE TO GO INTO CLARIFICATION NOW.

Yes.

OF THE FOLLOWING COLLEGES THAT YOU HAVE EXPLORED, WHICH WOULD YOU CONSIDER APPLYING TO. HARVARD UNIVERSITY, UNIVERSITY OF CALIFORNIA AT BERKELEY, BOSTON COLLEGE, GOUCHER COLLEGE.

Boston College, maybe Berkeley, and Harvard.

ARE THEY LISTED IN ORDER OF PREFERENCE THAT IS, IS YOUR FIRST CHOICE FIRST ETC.

No.

PLEASE TYPE THEM IN ORDER OF PREFERENCE.

Harvard University, Boston College, Berkeley.

YOU HAVE DECIDED TO GO INTO CLARIFICATION CONCERNING YOUR PREFERRED ALTERNATIVE HARVARD UNIVERSITY.
YOU HAVE ACCESSED THE EDUCATION DATA BASE AND GOTTEN SOME OF THE AVAILABLE DATA ON HARVARD UNIVERSITY.
IN EXPLORATION, YOU STATED THAT YOU CONSIDERED THE FOLLOWING TO BE IMPORTANT FACTORS IN CONSIDERING COLLEGE CHOICE . . GRADES, CLASS RANK, TEST SCORES, COURSES, GOAL.
NOW THEN, YOU SHOULD HAVE A FAIRLY GOOD IDEA OF WHERE YOU STAND IN RELATION TO THESE FACTORS AS WELL AS WHERE STUDENTS ADMITTED TO HARVARD UNIVERSITY STAND. RIGHT.

No.

WOULD YOU LIKE TO GO BACK TO EXPLORATION TO FIND OUT HOW YOU COMPARE WITH HARVARD STUDENTS.

No.

WOULD YOU LIKE TO CHOOSE ANOTHER ACTIVITY.

Sure.

WHAT WOULD YOU LIKE TO DO.

Find out about jobs.

HOW WOULD YOU LIKE TO DO THIS.

I would like to access the occupation data base.

O.K.

THIS OCCUPATION INFORMATION SCRIPT IS AN EXAMPLE OF HOW SPECIFIC INFORMATION CAN BE EXTRACTED FROM THE CIVILIAN OCCUPATION DATA BASE. FOR THIS SCRIPT, THE FOLLOWING FIVE JOBS WERE SELECTED: DOCTOR, LAWYER, BARBER, MACHINIST, AND MUSICIAN. FIVE CATEGORIES OF INFORMATION ARE PROVIDED FOR EACH TITLE-A DESCRIPTION OF JOB DUTIES, SALARY, BENEFICIAL HIGH SCHOOL COURSES, AND EDUCATIONAL REQUIREMENTS. IF AT ANY TIME YOU WISH TO STOP, TYPE THE WORD STOP.

YOU MAY NOW BEGIN.

Tell me about the work of a doctor.

DOCTORS ARE PROFESSIONALS WHO WORK IN MEDICAL SERVICES, GOVERNMENT, AND COLLEGES AND UNIVERSITIES. THEIR WORK IS SCIENTIFIC AND TECHNICAL, AND INVOLVES THEM WITH PEOPLE. ON THE JOB THEY DIAGNOSE AND PRESCRIBE MEDICATION FOR DISEASES, TREAT INJURIES, AND DO SURGERY.

What is his salary.

A BEGINNING DOCTOR CAN EXPECT TO MAKE AT LEAST $6500 PER YEAR, AND MAY EVENTUALLY MAKE A MAXIMUM OF $70000 PER YEAR. SINCE MANY DOCTORS ARE SELF-EMPLOYED, HE CAN SOMETIMES SET THE NUMBER OF HOURS HE WISHES TO WORK AND THEREFORE VARY HIS INCOME.

How many men are there in this profession.

70 TO 95% OF ALL DOCTORS ARE MEN.

What about his working hours.

DOCTORS OFTEN WORK NIGHTS AND WEEKENDS. DOCTORS SOMETIMES WORK OUTDOORS.

Describe his education.

A DOCTOR MUST COMPLETE PROFESSIONAL OR GRADUATE SCHOOL BEFORE ENTERING HIS OCCUPATION. HE NEEDS 4 TO 10 YEARS OF SPECIFIC TRAINING FOR HIS JOB AND THEN 6 MONTHS TO 1 YEAR OF ON-THE-JOB TRAINING BEFORE BEING CONSIDERED A FULL-FLEDGED DOCTOR.

How long do doctors live on the average.

UNFORTUNATELY THERE IS NOTHING FOR THAT SUBJECT. WOULD YOU LIKE TO KNOW THE TOPICS OF INFORMATION THAT ARE AVAILABLE FOR DOCTORS.

Yes.

FOR A DOCTOR THERE IS INFORMATION ABOUT WHAT HE DOES ON HIS JOB, HIS EDUCATION, ADVANCEMENT, APPLICABLE HIGH SCHOOL COURSES, SALARY, NECESSARY ABILITIES, PHYSICAL DEMANDS OF THE JOB, FUTURE GROWTH OF THE PROFESSION, PERCENTAGE WHO ARE MEN, HOURS, LICENSING REQUIREMENTS, AND WORKING CONDITIONS. WOULD YOU LIKE TO SEE ONE OF THESE TOPICS.

Yes.

WHAT IS IT.

What will be the need for doctors.

CURRENT INFORMATION INDICATES THAT IN THE FUTURE THERE WILL BE AN INCREASING DEMAND FOR DOCTORS.

What high school courses would it be helpful to take to become a doctor?

A HIGH SCHOOL STUDENT INTERESTED IN BECOMING A DOCTOR SHOULD CONSIDER TAKING THE FOLLOWING COURSES—BIOLOGY, LATIN, CHEMISTRY, FOREIGN LANGUAGES, PHYSICS, AND SOCIAL STUDIES.

For a lawyer.

A HIGH SCHOOL STUDENT INTERESTED IN BECOMING A LAWYER SHOULD CONSIDER TAKING THE FOLLOWING COURSES—BUSINESS, LATIN, ENGLISH, HISTORY, SPEECH, AND SOCIAL STUDIES.

What about his pay.

A BEGINNING LAWYER SHOULD EXPECT TO MAKE AT LEAST $5500 PER YEAR. IN ADDITION HE MAY RECEIVE HEALTH AND LIFE INSURANCE AND PAID VACATIONS. SINCE A LAWYER MAY BE SELF-EMPLOYED, HE CAN SOMETIMES SET THE NUMBER OF HOURS HE WISHES TO WORK AND THEREFORE VARY HIS INCOME.

What about a barber.

A BEGINNING BARBER SHOULD EXPECT TO MAKE AT LEAST $65 PER WEEK AND MAY EVENTUALLY MAKE A MAXIMUM OF $200 PER WEEK. IN ADDITION HE MAY RE-

CEIVE TIPS AND HEALTH AND LIFE INSURANCE AND PAID VACATIONS. SINCE A BARBER MAY BE SELF-EMPLOYED, HE CAN SOMETIMES SET THE NUMBER OF HOURS HE WISHES TO WORK AND THEREFORE VARY HIS INCOME.

And a machinist.

HE MAY RECEIVE FREE ADVANCED TRAINING, OVERTIME PAY AND HEALTH AND LIFE INSURANCE AND PAID VACATIONS. SINCE A MACHINIST MAY BE SELF-EMPLOYED, HE CAN SOMETIMES SET THE NUMBER OF HOURS HE WISHES TO WORK AND THEREFORE VARY HIS INCOME.

Describe his work.

MACHINISTS ARE MACHINE WORKERS IN THE MANUFACTURING OF METAL PRODUCTS, THE MANUFACTURING OF ELECTRICAL MACHINERY, UTILITY COMPANIES AND THE MANUFACTURING OF MACHINERY. THEIR WORK REQUIRES THEM TO DEAL WITH MACHINES AND TECHNIQUES. ON THE JOB THEY SET UP AND OPERATE MACHINE TOOLS TO MAKE OR REPAIR METAL PARTS OR PRODUCTS.

Tell me about the musician.

MUSICIANS ARE PROFESSIONALS WHO WORK IN SPECIAL SCHOOLS, DANCE HALLS AND SCHOOLS AND THEATERS, ORCHESTRAS, AND CLUBS. THEIR WORK IS ABSTRACT AND CREATIVE AND REQUIRES THEM TO DEAL WITH PEOPLE AND IDEAS RATHER THAN WITH THINGS AND OBJECTS. ON THE JOB THEY ENTERTAIN THE PUBLIC BY PLAYING IN SYMPHONY ORCHESTRAS, DANCE BANDS, OR JAZZ COMBOS.

What kind of an education does he need?

A MUSICIAN MUST COMPLETE JUNIOR HIGH SCHOOL AND SHOULD ALSO GRADUATE FROM COLLEGE BEFORE ENTERING HIS OCCUPATION. HE NEEDS 4 TO 10 YEARS OF SPECIFIC TRAINING FOR HIS JOB BEFORE BEING CONSIDERED A FULL-FLEDGED MUSICIAN.

Stop.

WOULD YOU LIKE A SUMMARY OF YOUR EXPLORATION OF THE OCCUPATION DATA BASE.

No.

DO YOU WANT TO GO INTO CLARIFICATION?

No.

WHAT WOULD YOU LIKE TO DO.

I would like to access the military data file.

IN THE ISVD MILITARY DATA FILE YOU MAY SEE SPECIFIC INFORMATION FOR THE ARMY, NAVY, AIR FORCE, AND GENERAL INFORMATION FOR OFFICERS AND ENLISTED MEN.
YOU MAY USE THE MILITARY SELECTION SCRIPT AND LET THE COMPUTER SORT OUT JOBS WHICH MAY BE OF INTEREST TO YOU, OR YOU MAY REQUEST DESCRIPTIONS FOR SPECIFIC MILITARY JOBS. WHAT DO YOU WISH TO DO.

Take the job selection script.

THE NAVY, ARMY, AND AIR FORCE EACH HAVE HUNDREDS OF SPECIALIZED JOBS. IN ORDER TO SIMPLIFY CLASSIFICATION, THESE HAVE BEEN CATEGORIZED BY FUNCTION ACCORDING TO CAREER FIELDS. THE INFORMATION PRESENTED HERE FOR EACH CAREER FIELD COVERS THE VARIOUS SPECIALIZED POSITIONS INCLUDED WITHIN IT. ALTHOUGH NOT ALL OF THE GENERAL INFORMATION GIVEN WILL APPLY FOR EACH SPECIALTY, YOU WILL RECEIVE AN OVERVIEW OF THE CAREER FIELD. TO DETERMINE WHICH CAREER FIELDS ARE BEST SUITED FOR YOU, IT WILL HELP FOR YOU TO ANSWER THE FOLLOWING QUESTIONS.
ARMED FORCES JOBS ARE PERFORMED IN MANY LOCATIONS. INDICATE WHERE YOU WOULD PREFER TO WORK BY SELECTING ONE OR MORE OF THE CHOICES FROM THE FOLLOWING LIST.

1. ON LAND
2. AT SEA
3. IN THE AIR
4. INDOORS
5. OUTDOORS

(Note—For this demonstration, only the first question of the military job selection script is shown. After the inquirer has finished with this segment of activities, he will be queried as to whether he wishes to continue with the Military Data Base.)

ARE YOU INTERESTED IN SEEING OTHER THINGS IN THE MILITARY DATA FILE.

Yes.

AND WHAT WOULD YOU LIKE TO DO NEXT.

What is there to do.

YOU MAY LOOK AT JOB DESCRIPTIONS OR REQUEST SPECIFIC INFORMATION FOR THE ARMY, NAVY, AIR FORCE, OFFICERS AND ENLISTED MEN.

Let me see information about the Army.

WHAT DO YOU WISH TO EXPLORE IN THE ARMY DATA FILE.

What about pay.

HERE IS THE PAY SCALE FOR ENLISTED MEN. ENLISTEES QUALIFY FOR PAY GRADES E-1 THROUGH E-9.

MINIMUM TIME IN GRADE FOR ADVANCEMENT	GRADE	MINIMUM MONTHLY PAY	MAXIMUM MONTHLY PAY
E-1 TO E-2 4 MONTHS	E-1	$ 90.60	$129.00 A MONTH AFTER 2 YRS. TOTAL SERVICE
E-2 TO E-3 6 MONTHS	E-2	100.50	141.00 A MONTH AFTER 2 YRS. TOTAL SERVICE
E-3 TO E-4 6 MONTHS	E-3	121.80	193.80 A MONTH AFTER 4 YRS. TOTAL SERVICE
E-4 TO E-5 1 YEAR	E-4	168.60	252.60 A MONTH AFTER 6 YRS. TOTAL SERVICE
E-5 TO E-6 2 YEARS	E-5	200.40	328.80 A MONTH AFTER 14 YRS. TOTAL SERVICE
E-6 TO E-7 3 YEARS	E-6	232.20	387.60 A MONTH AFTER 18 YRS. TOTAL SERVICE
E-7 to E-8 3 YEARS	E-7	269.40	528.60 A MONTH AFTER 30 YRS. TOTAL SERVICE
E-8 TO E-9 2 YEARS	E-8	428.40	587.10 A MONTH AFTER 26 YRS. TOTAL SERVICE
	E-9	510.60	657.30 A MONTH AFTER 26 YRS. TOTAL SERVICE

HERE IS THE PAY SCALE FOR COMMISSIONED OFFICERS.

RANK: AIR FORCE AND ARMY	NAVY	MONTHLY PAY: NORMAL MINIMUM	MONTHLY PAY: NORMAL MAXIMUM
SECOND LIEUTENANT	ENSIGN	$ 303.90	$ 336.30
FIRST LIEUTENANT	LIEUTENANT JR. GRADE	420.30	504.60
CAPTAIN	LIEUTENANT	583.20	633.30

MAJOR	LT. COMMANDER	700.50	807.30
LT. COLONEL	COMMANDER	930.60	992.40
COLONEL	CAPTAIN	1121.40	1216.50
BRIGADIER GENERAL	REAR ADMIRAL (LOWER HALF)	1295.10	1384.80
MAJOR GENERAL	REAR ADMIRAL (UPPER HALF)	1530.60	1592.40
LT. GENERAL	VICE ADMIRAL	1648.20	1766.10
GENERAL	ADMIRAL	1883.70	2002.60

IS THERE ANOTHER SUBJECT IN THE ARMY DATA FILE THAT YOU WOULD LIKE TO SEE.

What topics are left?

THERE ARE 9 GENERAL CATEGORIES OF INFORMATION IN THE ARMY DATA FILE—PAY BENEFITS, EDUCATION AND TRAINING, SPECIAL UNITS, WOMEN IN THE ARMY, PROMOTION, ENLISTMENT REQUIREMENTS, THE RESERVE PROGRAM, AND OFFICER STATUS FOR ENLISTED MEN. IF YOU ARE INTERESTED IN FINDING OUT WHAT ARMY OR MILITARY JOBS MAY BE SUITABLE FOR YOU REQUEST THE JOB SELECTION SCRIPT. WHAT TOPIC OR SUBJECT WOULD YOU LIKE TO INVESTIGATE.

What about officers.

AN ARMY MAN CAN ACHIEVE COMMISSIONED OFFICER STATUS BY ENROLLING AT A CIVILIAN COLLEGE OF UNIVERSITY FOR A BACHELOR'S DEGREE OR BY APPOINTMENT TO THE U.S. MILITARY ACADEMY OR OFFICER CANDIDATE SCHOOL. UPON COMPLETION OF ANY OF THESE PROGRAMS, HE IS COMMISSIONED AS A RESERVE SECOND LIEUTENANT.
WHAT ELSE INTERESTS YOU.

I don't want to continue.

ARE YOU INTERESTED IN SEEING OTHER THINGS IN THE MILITARY DATA FILE.

No.

HERE ARE ACTIVITIES THAT MAY BE OF INTEREST TO YOU. YOU CAN LEARN ABOUT YOURSELF BY STUDYING HOW YOU MAKE DECISIONS. YOU CAN PLAY GAMES WHICH GIVE YOU PRACTICE IN PLANNING EDUCATIONAL AND VOCATIONAL ACTIVITIES. YOU MAY ALSO WORK WITH THE EDUCATION AND OCCUPATION DATA FILES. DO YOU WISH TO

LOOK AT DECISIONMAKING SCRIPTS, PLAY A GAME, OR WORK WITH THE EDUCATION OR OCCUPATION DATA FILES.

Play a game.

IN THE ISVD THERE ARE TWO KINDS OF GAMES YOU CAN PLAY. ONE GIVES YOU PRACTICE IN TAKING RISKS. THE OTHER GIVES YOU PRACTICE IN PLANNING EDUCATIONAL AND VOCATIONAL ACTIVITIES. WHICH KIND OF GAME WOULD YOU LIKE TO PLAY.

The second kind.

THE LIFE CAREER GAME IS DESIGNED TO GIVE YOU PRACTICE IN FORMING YOUR EDUCATIONAL AND VOCATIONAL PLANS. SINCE YOU HAVE NEVER PLAYED THE GAME WITH THE SYSTEM BEFORE, IT MIGHT BE WISE TO GO THROUGH A GENERAL ORIENTATION. DO YOU WANT TO DO THIS.

Why not.

THINK HARD NOW. WHAT WAS THE FIRST GAME YOU EVER PLAYED.

Tag.

DO YOU REMEMBER HOW MUCH YOU LIKED IT.

Yeah.

WHY DID YOU ENJOY PLAYING TAG?

It was a blast.

AS CHILDREN WE LIKE TO PLAY GAMES SUCH AS TAG, MARBLES, HOP-SCOTCH, TIC-TAC-TOE, AND HIDE N GO SEEK BECAUSE THEY ARE FUN. THESE GAMES ALLOW US TO COMPETE WITH OTHER KIDS TO TRY AND WIN. BUT WE CAN'T SAY THAT THEY REALLY TEACH US ANYTHING THAT IS DIRECTLY APPLICABLE TO EVENTS IN REAL LIFE. SOME GAMES IN ADDITION TO BEING FUN, TEACH US SOMETHING ABOUT REAL LIFE ACTIVITIES. HAVE YOU EVER PLAYED A GAME THAT SEEMED TO BE TEACHING YOU SOMETHING ABOUT WHAT GOES ON IN REAL LIFE.

Of course.

WELL, GAMES LIKE MONOPOLY, BIG BUSINESS, AND RISK DO TEACH US ABOUT THINGS IN REAL LIFE (LIKE BUYING AND SELLING REAL ESTATE, ETC.). WE CALL SUCH GAMES SIMULATIONS.

THE LIFE CAREER GAME IS SUCH A SIMULATION. WHAT YOU CAN LEARN FROM THIS GAME IS THE KIND OF PLANNING THAT INVOLVES MAKING DECISIONS ABOUT THINGS THAT ARE HAPPENING NOW AT THE SAME TIME THAT YOU ARE THINKING AHEAD TO WHAT YOU MIGHT WANT IN THE

FUTURE. WHAT KINDS OF DECISIONS ARE YOU THINKING ABOUT NOW THAT WILL HAVE AN EFFECT ON YOUR FUTURE.

I do not wish to continue.

ARE YOU INTERESTED IN DOING SOMETHING ELSE.

No, I would like to stop.

YOU HAVE JUST EXITED FROM THE SYSTEM. GOODBY.

Because this demonstration was created in order to explore certain technical problems, and since this exploration was conducted by members of the Computer Division of ISVD rather than by the professional guidance specialists in the project, we do not wish to suggest that the content or the wording of the scripts are appropriate. Of course, we have come close to reflecting the interaction desired by David Tiedeman and Robert O'Hara, the project directors, but for our present purposes no effort was made to be particularly realistic about such things as reading levels, scope, relevance, or even accuracy of content. Furthermore, we consider our work thus far with ELIZA to be enlightening but rudimentary. We make no claim that the example provided here is anything but a first step toward the kind of natural language capability we seek. There is, for example, no present capability in ELIZA for extensive content analysis of student responses. Nor do we presently have a convenient procedure for combining features of ELIZA with other aspects of our system such as our author language or our statistical routines. Working on this combination is, of course, one of our major intentions.

A dialog on the Use of Natural Language in the Information System for Vocational Decisions

David V. Tiedeman and Robert P. O'Hara*

Dr. O'Hara: When I asked the question, "What is the advantage to having an ELIZA-type mode," you replied that it seems to be the ultimate that we are seeking.[1] This implies that MINORCA can't give the ultimate that we are seeking, and I'm inclined to think that it can. First, the students are so ignorant of the career development world that they need to be given some structures. They need to learn what the options are. They need to have some indication of the possible paths and the possible complexities of the paths. Second, as they move through these, they need to know very clearly the structure they have chosen from among the options or the path they have chosen from the options. They can do this from the ELIZA system, but it is much easier in terms of Prototype I and II to do it with a relatively large series of listings.

I think it is possible to cite sets of options after sets of options after sets of options (accompanying these sets is choice after choice after choice among these sets), and by doing so, create the awareness of the process the student is using, and I think that in so doing, we may come very close to exhausting the universe of options. The freedom exists not so much in the exhaustiveness of the sets of options, but in the modes of the combinations of the sets of options, in the modes of the combinations of choices among the sets of options.

I think that O'Mahoney is being extreme when he, for example, rejects a list of some 300 adjectives descriptive of human personality as being restrictive. I don't believe that anyone is capable of describing himself in terms of 300 sets of adjectives. What you are doing is opening up his world of understanding of himself to a far wider degree than he is capable of doing on his own. You can always give him the option—"something other than these."

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*Dr. Tiedeman is a Professor of Education at the Harvard Graduate School of Education and Director of the Information Systems for Vocational Decisions Project. Dr. O'Hara is the Executive Director of the Project.

[1] ELIZA is the name of a natural language system under development at M.I.T. by Professor J. Weizenbaum. (See description and discussion in the preceding paper.) MINORCA is another language like the IBM *Coursewriter.*

This leads to Prototype III, the description of an ELIZA-type system, with a lengthy psychological defense of why it is better than a multiple-choice-type system. The response in your favor seemed to me to be that the free-response mode with which you permit the student to enter is similar to the client-centered approach. It creates a less threatening atmosphere in which learning and perception can take place. This is very high and weighty reason for using it. However, I am not convinced that it is necessary.

Dr. Tiedeman: Go way back to the premise in which you found your argument. Your first premise is ignorance. My first premise is curiosity. My second premise is that at the conclusion of interaction in the system, I still want curiosity to exist, and I want that curiosity to be represented through the system in such a way that the person may know everything that is there, but still experience the illusion of being in conversation with this machine, at the same time that he is now letting his paths through its system be guided by what he has acquired and assimilated about what is taking place.

Now in ELIZA, you can have a system that starts with "In the beginning there is curiosity," and ends with "In the end there is the illusion of conversation." I know you are likely to argue that MINORCA permits curiosity in the beginning and I shall grant that it's likely to be present for a little while, but I'm inclined to believe that it will disappear more rapidly than if one were being curious about ELIZA. Furthermore, I will argue that MINORCA will never become the completed system that will let a person have the illusion of having all of this guidance machine inside of him rather than always having the illusion contradicted by the fact that every place he goes, he is always preceded by lists.

Those are for me some of the dimensions of the ultimate guidance machine. Those are the dimensions of curiosity and the illusory freedom our system should attempt to create, that is, the guidance of practice in going through this system that ultimately is intended to be inside of you rather than in the machine. Those are the prime dimensions of our so-called psychological curriculum, namely, that the psychological curriculum is really in the mode and the attitude that you let the inquirer adopt in the system. And it is necessarily linked to what a person is discovering about his self-concept when it operates in choice at stages of living.

We may be using the wrong terms. I will grant that knowing demands knowledge that other people have, but operating an intelligent and intuitive being involves the necessity to have this attitude about that knowledge as if it is there, but I do not have to have it in the exact same terms that other people have it.

Dr. O'Hara: But, doesn't my system allow for your not having it in the exact same terms when I emphasize the fact that the idiosyncratic element lies in the combinations of choices that are made from among the lists?

Dr. Tiedeman: How does your procedure permit the lists to be made by the people rather than by us?

Dr. O'Hara: Your system does not do this either. That's what ELIZA does, creates lists.

Dr. Tiedeman: My system is going to have to do this by compiling a natural language dictionary. The first step for a person who uses it has to be the construction of a thesaurus. The condition of freedom that I am attempting is one in which the person is internally operating with the dilemma of states and properties, or lists and categories, or the encapsulation of language experience. At the same time, he is not afraid to honor experience and to recognize that there are some things that he may hold on grounds that may not now be explicit, even though he tries to get an approximately explicit representation of them in order to make his dictionary work.

I think that the operation which we are trying to put into our guidance machine is an operation of actual deciding. The actual deciding will be there to facilitate the learning of personal responsibility in the language and experience paradox. The paradox is that the two can never be coterminal or coextensive.

Now, the learning of this paradox in decisionmaking practice then really gets involved with learning how to experience this paradox of wanting to be explicit without inordinate abandonment of your recognition that you know more than you are telling, so that you keep the feeling of intuition, of personalness, which is involved in doing so. Now the keeping of that feeling has to take place as we get our inquirers to engage in decisions. As we get them to engage in decisions, there might be diagnostic places where we might want to apply the fact that "Look, you want to do some more time planning or practice, so why don't you go play a game before you try bringing your own system into the general system context," or "Look, there are certain kinds of conceptions about decisionmaking that are fairly fundamental to the logic of what's going on in a nonlinguistic frame here, and we can put you into branches that will teach you more about these."

That for me is the theory of our system. This is what I am trying to protect, that we do have a system in which deciding takes place, and the learning that is taking place from deciding is the experience of the paradox of the noncoextensiveness of language and experience, and the honoring of both of these, so that one is experiencing it as a paradox.

Computer Programs in ISVD

Thomas Hutchinson*

The purpose of the Information System for Vocational Decisions (ISVD) is to develop an information system for career choice based upon a decisionmaking paradigm proposed by Tiedeman and O'Hara.[1] It is our belief that this paradigm may be more completely implemented through the use of a computer. The computer programs serve as an interface between the inquirer, the paradigm, and the hardware.[2]

Role of the Computer

The computer is not the most important aspect of the project. ISVD involves counselors. That which is automated is done so, in part, to free the counselor for counseling. Further, the programs which direct the automation are also more central than the computer itself. If we did not believe that we could design suitable programs we would not care to use a computer for this application.

The computer programs that are and will be written for ISVD are of two varieties. There are those programs that represent the guidance activities to be made possible through the use of the computer and those programs more nearly related to the hardware which support the guidance programs.

Guidance Programs

Scripts

Scripts are the groups of guidance programs which are nearest to the inquirer. They are nearest to the inquirer in the sense that what the inquirer sees is text or slides and what the inquirer hears is audio which the script directs to be transmitted. The scripts specify the amount of control over the inquirer, machine, and data base interaction.

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*Associate in Education, Harvard Graduate School of Education.

[1] Tiedeman, David V. and O'Hara, Robert P. *Career Development: Choice and Adjustment.* College Entrance Examination Board, New York, 1963.

[2] Ellis, Allan B., and Wetherell, Charles S. *The Computer and Career Decisions.* Technical Memorandum: 1. Information System for Vocational Decisions. 1967.

Scripts are written by guidance experts. There are several classes of scripts which will be written. These will be teaching scripts some of which will form a decisonmaking curriculum. Others will be called upon whenever the inquirer asks for an explanation of terms, such as "interests" or "sense of agency." There will be a third group of scripts that access the data bases and another scripts group that will comprise a career game.

The script writer specifies what stimuli he wishes to present to the inquirer, when a response is expected from the inquirer, and a set of rules which determine what material is to be presented next. Most often the rule includes provision for varying responses by the inquirer. For example, if the inquirer responds "yes" the next frame is 12 and if he responds "no" the next frame is 16. On some occasions the rule includes inquirer responses from more than one stimulus and more than one script.

Access Routines and Monitor

Complex rules are sometimes used at the end of a script for specifying what is the next appropriate script or scripts. For example, if the inquirer has entered the Review Access Routine with a discontinuity that he has explored but not clarified then he will enter the "ex post facto clarification" script. If the rules in the scripts were removed and examined separately some of these rules could be associated. Some of these groups of rules are called access routines, or sets of rules embedded in scripts providing access to some script groups. These access routines represent higher order activities, such as exploration, clarification, review, decisionmaking curriculum, and career games.

The exploration access routine provides access to scripts which in turn facilitate access to the data bases for identifying, expanding, and isolating an ordered set of possible choice alternatives. The clarification access routine uses data bases for testing commitment to the ordered list which resulted from exploration. The review access routine provides through a set of scripts access to the inquirer's past history as a data base. The decisionmaking curriculum provides access to scripts that teach the terms, concepts, and strategies of decisionmaking. The career game provides a means to practice the use of terms, concepts, and strategies.

Other sets of rules represent higher order processes, such as monitor. For example, at first the inquirer goes through the system with fairly direct suggestions and guidance as to which activities he should be pursuing. As he progresses we save his responses and choices. Periodically these data will be evaluated to see if he has attained facility with the Tiedeman-O'-Hara decisionmaking paradigm.

As greater degrees of efficiency are attained the amount of direct suggestion and guidance is decreased. Finally the amount of monitoring is also decreased. Thus, the inquirer is free to reject the Tiedeman-O'Hara paradigm, but he is not free to be ignorant of what he is rejecting.

Related Processes and Procedures

Some guidance activities depend upon other processes such as statistical analyses or language data processing. Statistical analyses will include such procedures as paired comparison analysis for O'Mahoney's self-concept test and computing dispersion matrices for centour analysis among flexibly determined subgroups.[3] Language data processing will include the processing of the inquirer's statements for dimensions used and at some time will allow nondirected questioning of the data bases by the inquirer. These processes will be computer programs written in computer language but called up by scripts.

Some of these processes may take, for example, 3 minutes of computer time. If there are 20 inquirers, all using as much computer time as is available in 1 hour of running time, each Inquirer gets a total of 3 minutes. Thus, a statistical procedure that took 3 minutes of computer time would, under time—sharing as described, take 1 hour before the results would be available at the console.

Although it may be reasonable to allow a response delay of 3 minutes, provided it is an expected delay, it is unreasonable to allow a 1-hour delay. One solution would be to do analyses off-line in the evening and have the results available the next day. This is the prototype I solution. However, it may be that the results would mean more if available during the same session.

Later solutions may include giving more time to an inquirer who has requested a lengthy procedure, and/or setting up a dummy inquirer. In the dummy inquirer plan a real inquirer may engage in other scripts and processes. When the computations are completed, the dummy inquirer interrupts the real inquirer to present the results.

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[3] Hutchinson, Thomas E. *Level of Aspiration and Models Applicable to the Problem of Choice of Career.* Technical Memorandum: 3. Information System for Vocational Decisions. 1967.

In the extra-time plan the inquirer requesting the process would get half of the time available. This means that the delay would be 6 minutes instead of 1 hour. If the normal response time were 5 seconds then the other 19 inquirers would have a 10-second response time for a period of 6 minutes.

Even 10 seconds may seem like a long delay. However, the machine is doing nothing for the inquirer while he reads text presented, ponders a reply, and types in his responses. Generally by the time these activities have been finished, the computer is ready for him.

It is seen that scripts call computer programs, contain rules that call other materials or scripts; elicit responses from the inquirer, and present stimuli. Some of these stimuli will be motion pictures, slides, and audio; but many more will be text. This fact has led us to plan a modification of the standard support programs.

Support Programs

Major Modifications

The standard time-sharing support system for the RCA Spectra 70/45 computer (which ISVD will use), called the Basic Time Sharing System (BTSS), contains many parts which are run under BTSS monitoring. Among these parts are procedures for entering, editing, dropping and locking files, requesting automatic off-line processing, and Fortran.

Fortran is a computing language. Our statistical routines will be written in assembly language. Furthermore, because the ISVD scripts present large quantities of text and receive text input from the inquirer, we need a text manipulation language more than a computation language. Therefore, one modification that ISVD will make is to substitute a text manipulation language for Fortran. The substitution is required because BTSS already uses most of the available core storage.

An examination of existing text manipulation languages caused us to decide that none were entirely satisfactory for our purposes. Consequently, we are writing a language that will contain the most useful (again for our purposes) attributes of several such languages. When completed the language will function as a part of a modified BTSS.

Another modification is made necessary because of the small amount of available core storage. BTSS normally stores tables of the names and locations of data stored on disk. Because we have so large an amount of data and so many inquirers, there will not be enough room for such tables. We need a way of accessing data stored on disk without using large tables.

We are writing a direct access management (DASM) package to reduce the size of core resident tables. DASM will fill a record knowing only the record name and the file name. It will process the record name by use of an algorithm in such a way that it gives a disk storage location. DASM will then write the record to that disk location. When a request is made to DASM for that record it will use the algorithm for the appropriate data base and compute the location again, this time reading the record into core. Thus, the only table is a table of data base names and algorithms.

Minor Modifications

Because the inquirers of ISVD will operate under script monitoring, the log-in area must be modified. First, the log-in area must not allow the inquirer direct access to the regular BTSS routine. Rather, it will call in the script network, the first access routine, giving control to the scripts.

When a person logs in to BTSS, the system finds a large area of saved disk space permanently reserved for that user. If that amount of space were always available, we would need a very large number of disk packs or we would be able to service very few inquirers.

Our solution is to reduce the size of these areas and to use them as dummy areas, reading an inquirer's record into this space at the time of log-in. At the same time we will add other log-in procedures to check what type of inquirer it is (counselor, counselee, researcher, programer, script writer, systems manager, etc.) since each will have different access to the system. We will also provide a way of being as sure as possible that the inquirer is who is indicated.

Once BTSS has been modified we will call it MBTS. MBTS will contain DASM and a text manipulation language. The guidance programs (scripts) will be first written in the text manipulation language. However, this language is still too much like a computer language for guidance people to master easily.

We are in the process of writing a language called MINORCA. This language will be nearer English than the text manipulation language. It will allow the guidance staff to write scripts so that what they want may not be ambiguous. At first, scripts written in MINORCA will be hand coded into the text manipulation language by the computer staff.

At a later time MINORCA and the text manipulation language will be changed so that the text manipulation language will be able to take MINORCA statements and translate them into the text manipulation language automatically. A script will be written in MINORCA and translated into the text manipulation language. This will make the guidance activity desired by the guidance person an ability of the computer.

To this point the discussion has been about the parts of the system. Let us now look at the parts as they interact with each other.

Guidance Program and Support Program Interaction

A counselee sits down at an ISVD console. He logs in by means of directions posted at the console. He types in a number indicating which console is being used.

The MBTS log in routine gives a command to DASM for the ISVD "log-in" script. DASM uses the algorithm for the script data base to compute the location of the first record of "log-in." DASM reads that record into core.

The text manipulation language executes the script, i.e., sends stimuli and receives responses. The inquirer is asked to supply his name and a request is made to DASM to get the inquirer's records into core. The script through the text manipulation language asks a test question to which it has the answer. If the inquirer's response is correct the script continues, otherwise there is an automatic log-out.

The "log-in" script also compares the status indication of the inquirer's record with the known status indicators (e.g., counselor, counselee) and uses this information for giving a request to DASM for the next appropriate script.

The next appropriate script may depend upon whether the inquirer wishes to continue from where he left off on his previous session, or to start a new track through the script network. In this way the parts of MBTS function together to allow the inquirer the freedom to choose which of the available guidance activities he wants, while also providing suggestions for the next appropriate activity.

Problems Associated With Simulating a Counselor's Function in the Student Decisionmaking Process

Tommy L. Roberts*

During the past decade computer modeling and simulation techniques have been employed in a wide variety of research, development, and system-analysis activities. Early applications of computer modeling and simulation techniques have been concentrated in war game activities, military systems analysis, and military operations research. More recently such applications have been successfully made in economics, business, and industry. Such applications are currently being made in the field of medicine as well as the behavioral sciences.

Efforts during recent months have resulted in a growing interest in the rapid introduction and emerging development of computer support systems in the field of educational-vocational guidance and counseling. Initial attempts to design workable systems and applications in this field have been complicated by those problems associated with simulating human behavior and function. The fact remains, however, that pioneering work is always seemingly necessary as a genesis of innovation and change. This has been historically true in business, industry, and medicine. Education will probably be no exception.

Computer modeling and simulation techniques can be effectively applied to any discipline in which phenomena can be quantified and represented by a set of mathematical exemplars. However, the application of such techniques in the behavioral sciences is complex inasmuch as human behavior is not easily quantified. In fact, it is rarely predictable. The challenge of designing adequate simulators for testing and appraising new systems is one most difficult to describe.

In applying computer modeling and simulation techniques to guidance and counseling, one must first confront the problem of defining optional counselor role and function in student decisionmaking. What is this function? Who has defined it? Can it be simulated? What are the problems associated with such a task?

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*Professor of Education, Oklahoma State University.

Under the editorship of Gilbert Wrenn, Byrne proposed a set of specifications of maximum counselor function. These specifications included (1) counselor concern and involvement in pupil development, (2) psychological appraisal, (3) social phenomena, and (4) the facilitation of student self-realization and actualization.

He further described the counselor's function as that of (1) evaluating the status and trends of an individual's development, (2) helping an individual work through developmental obstacles and situationally caused dissatisfactions, and (3) helping an individual make and implement decisions about and plans for his life course, as reflected in an occupation, education, marriage, and other dimensions of his pattern of living.

Stewart and Warnath stated that "a traditional counseling role has been one of helping clients to evaluate themselves and their environmental realities." [1] They further state that "instead of merely helping youth to adjust to existing conditions, we are proposing that counselors actively seek to change the social conditions that hinder youth's struggles to attain a clear-cut sense of identity."

As can readily be seen, in one definition the counselor is evaluating and in the other he is helping the client to evaluate. Such differences make the job of simulating most difficult when one considers the question of which function is best for the client.

Blocher says, "Counseling is a planned, systematic intervention in the life of another human being. This intervention is aimed at changing that person's behavior. The counselor, if he accomplishes anything, inevitably influences the nature, degree, and direction of these behavioral changes." He further points out that "counseling occurs when there is a mutuality of goals achieved between counselor and client." [2]

My immediate reaction to this concept is that man will never be able to safely assume he can adequately intervene in the life of his fellow man when he continues to so misunderstand himself. I am further inclined to further ask: Goals for whom? For what purpose? Why mutuality with counselor? Are we so naive as to assume that a client's goals are not his own and therefore should not be considered completely independent of the counselor?

In 1962, Adams defined counseling as "an interacting relationship between two individuals where one, the counselor, is attempting to help the other, the counselee, to better understand himself in relationship to his present and future problems."[3] McKinney defined it as "an interpersonal relationship in which the counselor assists the total individual to adjust more effectively to himself and to his environment."[4]

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[1] Stewart, Lawrence H. and Warnath, Charles F. *The Counselor and Society.* Boston: Houghton Mifflin Co., 1965. Preface X1.

[2] Blocher, Donald H. *Developmental Counseling.* New York: The Ronald Press Company, 1966. p. 13.

These and many more definitions may be found in the literature. However, the same lack of precise definition will be found. Therefore, it can easily be seen that of major concern are those problems associated with simulating a function that has yet to be precisely defined.

Sachman defined simulation as the casting, acting, and the configuration of objects and events in the referent test. He states that "simulation is the man with a thousand faces. Simulation is analogy, and the human capacity for analogy is unlimited."[5] Fitzpatrick (1962) stated that simulation was the symbolic or physical representation and exercising of some aspects of a systems.

As used in the present context, simulation involves considerable guesswork and obvious risks in terms of time, cost, and ultimate operational payoff. It involves problems associated with fantasy, wishful thinking, free associative exploration, and many other types of innovative games yet to be generated.

Obviously, before the counselor's function can be accurately simulated it must be defined in "real" terms. I venture to say that it will be most difficult to determine how all counselors function. In fact, I will go even further and state that for each counselor's function simulated there will always be another, another, and another counselor who functions differently under the same circumstances and who does not fit the specifications of the simulation model. Even more difficult will be the task of distinguishing between the functions as performed by the professionally adequate counselor and the self-appointed quack.

"Counseling and counselor function, as defined here, will not necessarily be predicated upon current literature, but based on a definition amenable to the needs of the project upon which I am currently working. Counseling is the process of facilitating client self-understanding and self-management through an assessment of an individual's assets and liabilities in relation to the requirements of his life goals. The counselor functions as a vehicle of client actualization and the fuel necessary to propel such a vehicle is "useful information."

These definitions encompass a combination of "trait factor" and the "client centered" counseling theory. The general theory is that a client will experience therapeutic value, improved functioning, and self-organization by interacting with a counselor who is genuinely himself in the relationship and who must be able to swiftly and accurately access adequate information, must exhibit unconditional positive regard for the client, and must experience an empathic understanding of the client's internal frame of reference. Adequate data, a professional counselor, and sufficient client concern for making "intelligent" decisions are all basic to successful counseling as postulated here.

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[3] Adams, James F. *Problems in Counseling.* New York: The Macmillan Co., 1962. p. 1.

[4] McKinney, Fred. *Counseling for Personal Adjustment.* Boston: Houghton Mifflin Co., 1958. p. 22.

[5] Sachman, Harold. *Computers, System Science and Evolving Society.* New York: John Wiley & Sons, Inc. 1967.

When the limits or constraints to be placed upon the simulation model area are recognized, it becomes obvious that certain counselor functions cannot be readily simulated. Martin points out that "humans can perform certain higher order perceptive thinking processes which cannot be programed on computers in the present state of the art. Therefore, the application of the computer may not be too helpful for tasks that are predominately perceptive in nature."[6] He further claims that the human capability of making judicious decisions can be greatly enhanced by using a computer to give accurate, up-to-date information relevant to the decisionmaking process. Certain critical decisions should always rest with the human evaluator. These decisions cannot be programed for the computer.

The task of accessing, processing, and supplying the client with "useful information" is one most conducive to simulation. These tasks involve simulating the counselor's input, process, and output of client data. Naylor describes the function as one of interaction between exogenous (input), status (state of a system), and endogenous (output) variables.[7] (See figure 1.)

Simulation as used here is a numerical technique for conducting controlled experiments on a digital computer, involving certain types of mathematical and logical behavior exemplars in a human counseling relationship.

There are three basic types of simulated systems: (1) fully automatic, (2) semiautomatic, and (3) integrated. The first is primarily quantitative and not amenable to application in situations where human roles significantly affect the system's internal process. The second, applicable to processes where a need exists for critical human decisions, provides a human interrupt capability in the process. The third is applicable where there is a definite need for controlled inputs, particularly in training programs and laboratory work.

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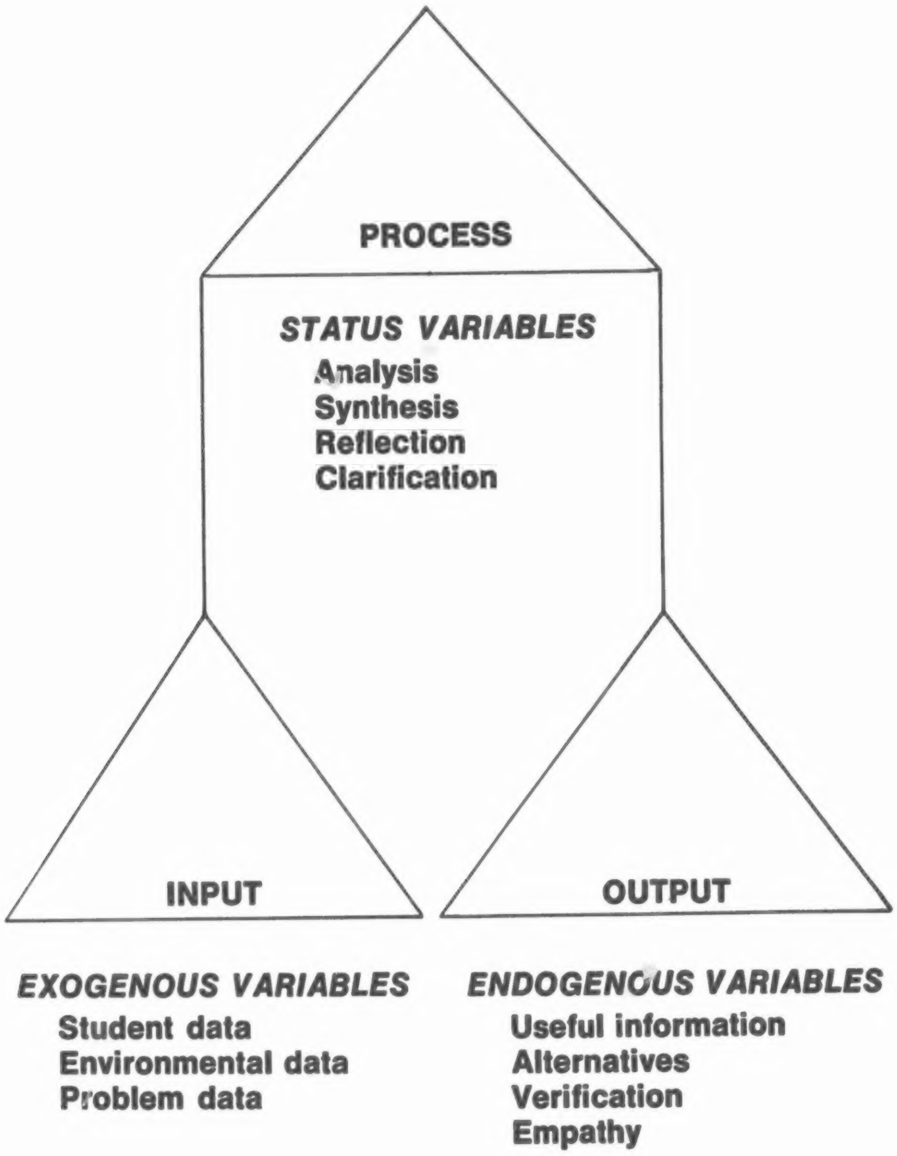
[6] Martin, Francis F. Computer Modeling and Simulation. New York: John Wiley & Sons, Inc., 1968. p. 5.

[7] Naylor, Thomas M., and others. *Computer Simultation Techniques.* New York: John Wiley & Sons, Inc., 1966. p. 11.

The decision to use simulation techniques should be made on the basis of applicability, cost, and simplicity. Before utilizing simulation techniques one should be reasonably sure he can derive a satisfactory approximation to the solution of his problem that the technique will be amenable to interpretation and practical in terms of return for dollars spent.

Figure 1.—The Counselor Information Transmission Function in the Student Decisionmaking Process.


PROCESS
STATUS VARIABLES
Analysis
Synthesis
Reflection
Clarification
INPUT
OUTPUT
EXOGENOUS VARIABLES
Student data
Environmental data
Problem data
ENDOGENOUS VARIABLES
Useful information
Alternatives
Verification
Empathy

Of greater concern than the problem of applicability, cost, and simplicity, many of which exist and are important, are those relating human behavior and function. More specifically, this refers to the behavior of a human counselor who functions as a transmitter of "useful information" and information that will help students make intelligent decisions.

It is common knowledge that computer programs can and have been written that are germane to human behavior as reflected in game decisions. Such games as checkers, bridge, chess, and ticktacktoe have been programed successfully. Such programs are predicated upon a set of initial conditions and legal rules for playing the game. There is a need for participants in the game to make critical decisions during the game which affects the output. Therefore, such games (simulations) are semiautomatic in nature. Such complex games generate an astronomical number of alternative sequences and present many problems associated with finding ways to limit the search function.

Human behavior in a relationship with another human, as required in a counseling relationship, has yet to be precisely predicted by any given set of predetermined rules. Each time the counselor is confronted with a new client the rules are subject to change. What kind of change and how severe is this change when considered in relation to counselor requirements is the problem.

It is because of the unpredictability of client change that applications of fully automatic simulation techniques are open to question. Even the simplest of simulation systems must therefore provide the human interrupt capability. Without this capability the system will probably fail when confronted with unpredicted change in client behavior.

In summary, the major problems associated with simulating the counselor's function in the student decisionmaking process include: (1) defining "counseling" and "counselor function"; (2) distinguishing between the professionally adequate counselor and the self-appointed quack; (3) determining the degree of automation to use in applying the simulation technique; and (4) controlling variance in the counseling relationship generated by client differences.

There is little doubt that simulation techniques are potentially applicable in all disciplines. The application of such techniques should be limited to those problems where the application will be useful and produce meaningful results.

Before serious attempts are made to utilize simulation techniques in computerizing human functions there needs to be some serious soul searching. One needs to ask whether the synthetic reproduction of a multidimensionally complex human function would be of value in developing new support systems.

Equally important is the question of whether or not it is theoretically possible to build a simulator which could respond to any situation with conclusions based on feeling, emotions, perceptions, biases, and intuition. In any event, the problems associated with building a computer simulation system with the capabilities of functioning like man seem to thwart the logic of such a notion.

Implementation Problems: Counselor Acceptance of Systems

Joseph T. Impellitteri*

One of the crucial questions that must be answered is, "Is it the implementation of the experimental prototypes in which we are primarily interested, or the eventual highly developed models of the future?" Let us examine the implications of the alternatives. In the first we become involved in obtaining the cooperation of practicing counselors who have probably received their master's degrees from our institutions and have already been identified as future doctoral students in counselor education. We are primarily concerned with getting the "best" people with the "best" ideas to cooperate with us in the development and trials of our tentative models. Ten or 12 interested and highly qualified counselors would be most adequate in the majority of situations to satisfy our needs at the prototype stage.

As we design, try out, tentatively evaluate, revise, and re-try these tentative systems models in a highly cooperative school setting, we become absorbed in the task of developing the "ideal" guidance support system for this peculiarly innovative environment. The application of our efforts beyond this willing and cooperative climate would appear to be quite limited. Thus, the guidance support systems designer finds himself in a somewhat awkward implementation situation.

In listing the stages of development and examining the degree of counselor acceptance at each stage, this particular situation should be clarified to include the following:

1. Development of first generation prototype—acceptance by the general population of counselors is extremely limited (no trial data nor counselor-student feedback available); counselors who would be willing to assist in trials are those who have had prior relationship with support systems designers and who possess a high degree of acceptance of any new approach.

2. Counselors identified in the first stage become involved in planning of trial.

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*Assistant Professor of Vocational Education at the Pennsylvania State University.

3. Trial undertaken and completed.

4. Feedback obtained from both students and counselors involved in field trial.

5. Prototype system revised and/or expanded based on feedback, or in fact abandoned.

6. Development of second generation prototype—acceptance by the general population of counselors increases but is limited mainly to those who are most highly accepting of any new approach; some generation of interest among remainder of counselors.

7. The planning of trial, actual trial, feedback and revision is repeated with a somewhat larger group of counselors.

8. Future generations of prototypes proceed, each resulting in a higher degree of counselor acceptance. This acceptance is limited only by the occurrences in stages 4 and 5, the feedback and further revision stages. (The feedback upon which the revisions are based always proceeds from an atypical environment.) At each stage of development the increased counselor acceptance is probably due merely to the demonstration of additional activity rather than that the revised models become suitable to a greater proportion of the general population of counselors.

What we most probably end up with is that no more than 15 to 20 percent of practicing guidance counselors would be willing to implement even a cost-feasible guidance support system. If the cost is higher the percentage would be lower.

Perhaps these figures are far off-base, and perhaps the argument itself is even further off-base, but I think not. What I think is likely to occur is that we end up by producing a finely honed guidance support system which can and will be actually used only by those counselors attuned to this razor sharpness. If there were more counselors today or if more would be available in the next 20 years, I would not perceive this as a problem.

If one were to accept the situation as stated above, is there then no resolution to the problem? I believe there could be. If we really do feel that counselors must be accepting in order that our support systems operate effectively, then we must plan for it. If we are really interested in the implementation problem, then we must plan for it now.

The four propositions and the discussions of their implications given below are not meant to be solutions but considerations involved in the implementation process:

1. Since the total guidance program in a school unit is a

part of the total education system of the community which it serves, each guidance program (from school unit to school unit across the country) is unique. Widespread counselor acceptance of a guidance support system is possible only to the degree to which the support system is directed toward the communalities between one guidance program and the next. A very broad-gauged guidance support system is limited in counselor acceptability precisely because it attempts comprehensiveness.

2. The degree of counselor acceptance of a guidance support system is inversely related to the portion of the school's total guidance program which the support system has been designed to include.

The more numerous the roles and function of a counselor which the system has been designed to handle the more threatened most counselors would feel. There appears to be a continuum of alternatives available to the systems designer. The extremes of the continuum are representative of quite diverse strategies. At the one extreme, the strategy calls for quite gradual introduction into the guidance program of a guidance support system with limited scope. The other extreme represents the all-or-nothing strategy. Obviously implementation problems will be more acute with the latter kind of strategy than with the former. What is involved, however, as the primary consideration to choice of strategy is the determination of the best means to reach the accepted objective (if, in fact, such an objective has been formulated).

3. Schools in which counselors are least likely to accept a guidance system approach need most improvement, and conversely, schools in which counselors are most likely to accept a guidance system approach need least improvement.

If, indeed, we wish to make the greatest impact on guidance is there not a choice between developing approaches suitable to counselors who need the most help as opposed to developing an approach acceptable to only those counselors who are "most capable"? It appears that we are currently leaning toward this all-or-nothing approach.

4. Since the counselor's role is affected by the introduction of a guidance system.approach, the counselor should be aware of the function of the system in the total guidance program.

Counselors must be involved in the planning and developmental stages in order that implementation problems be minimized. The counselor must satisfy himself both that the guidance system fits into the total guidance program and that it fits in what he perceives as a proper place.

Obviously, I have offered no answers to implementation problems, merely considerations, since there are as many types of counselors as there are types of schools and students. There appear to be that many problems in implementing the systems. Because of this, I do not believe there will be a guidance support system developed in ten thousand years that will be acceptable to even a majority of counselors, and I am both highly optimistic and highly thankful for that.

The major recommendation I would make is for counselor involvement in our efforts at all stages—planning, trial, evaluation and revision within the framework of what he sees himself best doing in his particular school system with his particular youngsters. Counselors must become capable of developing their own guidance support systems to suit their own particular needs. Their involvement in our efforts would provide them with an impetus to direct their own activities. The future of guidance will depend upon the ability of counselors to do this job for themselves, perhaps with the help of people like ourselves.

PART III
some vocational guidance systems under development

General Overview*

The systems approach is a management tool for the orderly solution of complex problems. It consists of procedures for planning the development and coordination of new techniques, materials, and hardware to accomplish prespecified objectives. Systems design and analysis techniques have been successfully applied to military and space programs and are now being applied to instructional and vocational guidance programs. In vocational guidance, the systems approach is useful in developing and coordinating instructional materials, counseling techniques, and computer and audiovisual hardware to bring about student behavioral changes indicative of increased vocational maturity.

In this section, several attempts to apply systems-approach techniques in vocational guidance are described. A general overview of ten of the systems development projects represented at the Third and Fourth Symposiums for Systems under Development for Vocational Guidance is included. These systems are in various stages of completion and therefore more detailed information is available on some than on others. Whenever possible, the following information will be presented for each:

> (1) System objectives, i.e., what changes or shifts in student vocational development the system is attempting to facilitate; (2) System evaluation design, i.e. how these shifts will be measured; (3) System functions, i.e. what guidance functions will be performed by the system and how they will operate; (4) System developmental requirements, i.e. what materials will have to be developed in the process of constructing the system; and (5) System developmental progress.

Additional information on any of these systems should be requested from the project director rather than from the Office of Education.

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*Part III was prepared by Judith Weinstein, Project Officer, Basic Studies Branch, Division of Comprehensive and Vocational Education, Bureau of Research, U.S. Office of Education.

The Harvard-NEEDS-Newton Information System for Vocational Decisions

The Information System for Vocational Decisions (ISVD) is a computer-based vocational guidance system being developed jointly by Harvard University Graduate School of Education, New England Education Data Systems (NEEDS) and the Newton, Massachusetts Public Schools.[1] The principal investigators for this project are: David V. Tiedeman (Chairman, Executive Committee), Robert P. O'Hara (Executive Director), Russell G. Davis, Allan B. Ellis, Edward Landy, Richard M. Durstine, Wallace J. Fletcher, and Michael J. Wilson. The project was initiated in June 1966 and is scheduled for completion in July 1969. The project is receiving support under a grant from the U.S. Office of Education, Bureau of Research.

Overview of the system

The Information System for Vocational Decisions is the most complex computerized guidance system now under development. It differs from other systems in scope, in the uses to which the computer is put, and in the flexibility it provides to the student in his interactions with the machine.

In scope, the system attempts to encompass a complete and ideal decisionmaking environment. The specifications for this environment were derived from vocational decisionmaking theory and include easy access to decisionmaking resources and instruction and supervised practice in their use.

The computer plays a major role in all aspects of the system. Information about career options is available through a computer data bank; instruction in career decisionmaking is available through computer-assisted instruction units, and supervised practice in decisionmaking is available under computer-monitored conditions.

In using the system, the student interacts directly with the computer. This interaction is accomplished through what resembles a natural language conversation between the student and the machine. Because the student converses with the machine in natural language rather than in a multiple choice format, he has more control over what system activities he will engage in and more freedom to give the system data about himself.

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[1] David V. Tiedeman, Harvard Graduate School of Education, Information System for Vocational Decisions, 220 Alewife Brook Parkway, Cambridge, Mass. 02138.

System objectives

The broad objective of the ISVD is to facilitate responsible decisionmaking by individuals at all stages of vocational development. By responsible decisionmaking, the developers of the ISVD mean the imposition by the individual of direction and reason on the bridging of transition points in his life, such direction and reason being the product of his emotion, comprehension, and will. They hypothesize that responsible decisionmaking will result from providing a student with supervised experience in relating accurate and comprehensive data about careers to information about his personal characteristics.

More specifically, the system will attempt to develop in the individual the following conditions necessary for responsible decisionmaking:

(1) An understanding of the process of decisionmaking and the psychology of career choice; .

(2) An accurate and comprehensive understanding of alternatives and their consequences with regard to the specific decisions confronting an individual at any given time;

(3) An understanding of his personal characteristics including knowledge about his ideosyncratic value system and its consequences for decisionmaking;

(4) A "sense of agency" or functioning belief by the person that he *can* choose and thereby become a determining agent in the course of his career, and that he assumes personal responsibility for the consequences of his choice.

System evaluation design

Prototype II of the ISVD, to be field tested in several locations from February to May 1969, will be evaluated in terms of its success in improving student vocational decisionmaking. This will include an assessment both of the way in which a student uses data in decisionmaking and of the quality of the data he uses. Information about student decisionmaking will be obtained from the computer record detailing the history of the student's interaction with the machine and from interviews with counselors assigned to supervise this interaction. The computer record of the student's interaction with the machine will include, where possible, scores on on-line administrations of instruments to assess vocational self-concept, sense of agency, work values, knowledge of occupational constructs, vocational planning readiness, occupational interests, occupational skills potential and aptitudes.

System functions

The ISVD will provide three guidance services to students: (1) accurate, complete and relevant data for use in decisionmaking, (2) training in decisionmaking, and (3) supervised practice in decisionmaking.

In the ISVD, the first and second functions will be provided mainly by computer; the third both by computer and school counselor.

The information function will work in this way. Extensive data about career choice options and student characteristics will be stored in the computer. This data will be organized into five major files: occupational, educational, military, personal and family living, and student characteristics. The first four files will range from general to specific and will include data relating to the main choice points which confront the student within these four areas (e.g., choice of secondary school curriculum, choice of post-secondary school education, etc.). The occupational data will both describe present conditions and predict conditions for the next 10 years. The fifth data file, inquirer characteristics, will be organized into two parts. One part will describe the characteristics of system users and will contain followup information relating these characteristics to later choices and successes. The second part will contain material generated during the user's interaction with the machine, including his scores on a variety of on-line tests, a history of how he developed justifications for preferences, and the consequences of his pursuit of these preferences.

Three primary computer routines will provide students with access to the data files. These computer routines will be structured in accordance with the Tiedeman-O'Hara Paradigm of Vocational Decision-Making.[2] This paradigm essentially conceives of decisionmaking in relation to (1) the passage of time and (2) the undertaking of risk and activity to achieve what one elects to achieve. This conception permits division of the time intervals into a period of anticipation and a period of accommodation. Anticipation may be subdivided into the following stages: exploration, crystallization, choice, and clarification. Accommodation may be subdivided into induction, reformation, and integration.

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[2] See Tiedeman, D.V., and O'Hara, R. P. *Career Development: Choice and Adjustment*. College Entrance Examination Board, New York, 1963.

The three ISVD primary access routines, entitled *exploration, clarification,* and *review,* correspond to the Tiedeman-O'Hara Paradigm in this way. The *exploration* routine will facilitate the generation of alternatives leading to crystallization, or the identification of preferred alternatives. The *clarification* routine will presume exploration, crystallization, and choice and will engage the inquirer in questions of clarifying a previously designated alternative. The *review* routine will incorporate the three stages of accomodation for each choice in career development.

More specifically, the *exploration* routine will allow the person to rove through the data files at random. During this process, the student will be encouraged to set up criteria whereby he can compare alternatives. At his request, the computer will help him review the extent to which his preferred alternatives are congruent with his criteria. Also, at his request, the computer will suggest additional alternatives for exploration based on a comparison of his characteristics with established associations between such characteristics of others and their preferred alternatives. The *clarification* routine will query the inquirer about the depth of his knowledge concerning favored alternatives, including his understanding of future alternatives which are likely linked with present preferences. The *review* routine will be for use by the student after an expected future event has occurred. This routine will permit the user to call up and compare prior statements about that event with what actually did occur.

Training in vocational decisionmaking will be available to students through two sources: (1) didactic instruction in the decisionmaking process; and (2) simulated career decisionmaking experiences. Didactic training in decisionmaking will be available through computer-assisted instructional (CAI) units. Students will be given an introduction to vocational decisionmaking which will instruct them in the use of the Tiedeman-O'Hara Paradigm. During their experience on the computer, they will have available CAI units on decisionmaking, vocational development, educational development, and psychosocial development.

Simulated materials for use in career decisionmaking will include decision problems and games to be solved in interaction with the computer. These simulations will allow the student to experience under low risk conditions the meaning of decisions about work and the effect of educational decisions. The decision problems will simulate decisionmaking required in various occupations. The games will include educational, career planning, and achievement motive games. The educational and career planning games will be adoptations of Sarane Boocock's Life Career Game. The education game will work in this way. The student will be asked to predict performance for an individual and make choices of educational and curricular activities, including time allotments for each chosen activity.The game will go through several rounds at the conclusion of which the computer will give the student a description of the person who has "graduated" from high school and an evaluation of the player's decisionmaking abilities. This evaluation will be in terms of risk-taking, information seeking, goal-setting, time-allocation, planning, adjustment of program to feedback, and ability to perceive linkages of information between person and situation.

The ISVD's developers intend to make available to the individual supervised practice in decisionmaking in two ways. Throughout the field testing period counselors will be available to students for regularly scheduled conferences to help them relate general aspects of the system to their personal decision process and to assist them in decisionmaking.

Second, the student will have available a computer capability for supervision through the secondary computer routine called MONITOR. This routine will evaluate the student's decisionmaking behavior in interaction with the machine in terms of student mastery of the stages in the vocational decisionmaking paradigm. The student will be taught the basic computer routines making up MONITOR if and when he desires to have them. In later prototypes of the system, the student will be able to write his own monitoring criteria, or bases, to some extent, and have the computer evaluate his online interactions in terms of these bases.

The planned console configuration for the ISVD includes cathode ray tube, keyboard input, hardcopy printer, random access slide projector, and tape playback. All of these items will be computer controlled.

System developmental requirements

Some of the major activities which were undertaken to develop a functioning ISVD include:

(1) The collection and compilation into files of data on education, training, job characteristics, and user characteristics. This has involved research on more effective methods of analyzing data for use in the program (e.g. the use of multivariate classification techniques for deriving

broad skill cluster patterns) and research into methods for deriving probabilistic statements about future changes in work.

(2) The development of computer programs for retrieval and display of data from the above files.

(3) The development of specialized computer programs for the automated analysis of the *Dictionary of Occupational Titles.*

(4) The development of specialized computer programs for various modes of interaction between the data in the system and its users. This has involved the development of a network of scripts enabling the student to interact with the computer in natural language.

(5) The development of computer-assisted instruction units in decisionmaking.

(6) The choice or adaption of display devices (audio, cathode ray tube, tape, or slide) to connect the users with the data.

System developmental progress

Prototype I of the Information System for Vocational Decisions was implemented during 1968. This prototype was extensively tested during September-December 1968 by the professional personnel of the ISVD and by small numbers of students. The results of the initial field testing will be used to change Prototype I into Prototype II. Prototype II, operable in February 1969, will be field tested in five locations: an upper elementary school in Newton, Massachusetts, a junior high school in Newton, a senior high school in Newton, an organization focused on problems of the disadvantaged in Waltham, Mass., and the Harvard Graduate School of Education. The results of that more extensive field test will be used to formulate recommendations for Prototype III.

The IBM Experimental Educational and Career Exploration System

The Experimental Education and Career Exploration System (ECES) is a computer-based system being developed by the International Business Machine Corporation (IBM) under the direction of Frank J. Minor.[1] The project, initiated in January 1966, is being supported by the Advanced Systems Development Division of IBM.

Overview of the system

ECES grew out of a need to reduce the information handling problems involved in providing individualized vocational guidance to students. Through the use of computer technology, this system will help reduce the information handling problems involved in making educational and vocational facts readily available and in relating these facts to pertinent information about the student.

The system is designed for use by students as one part of the educational and vocational guidance services offered in schools. Student use of this system should enable the student to sharpen his focus on career goals and the means by which they can be achieved. The presence of the system in the schools should also enable the counselor to function at a higher professional level. The system will: (1) familiarize the student with problems of educational and vocational planning, (2) provide the counselor with information about student progress in formulating plans; and (3) free the counselor from having to maintain a general educational-occupational information library.

System objectives

IBM has used a vocational development theoretical framework in planning the student behavioral changes to be expected as a result of use of this system. The system was designed to be of greatest service to students during the latter phases of the growth stage and throughout the entire exploratory stage of vocational development. The vocational development tasks to be accomplished during these stages may be described as follows: Ages 12 to 14 are times of improving self-knowledge; ages 15 to 17 are characterized by a consideration of needs, interests, capabilities, values, and educational opportunities, and by trying out tentative vocational choices in fantasy, discussion, course selection and part-time work; ages 18 to 21 are when the youth gives more weight to reality considerations in his vocational planning as he actively enters post-high school training or the labor market.

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[1] Frank J. Minor, Advanced System Development Division, International Business Machines, 2651 Strange Blvd., Yorktown Heights, N.Y. 10598.

This system should help students accomplish these developmental tasks by providing them with such exploratory experiences that—

(1) Each student may broaden his knowledge of work and his personal occupational multipotentiality.

(2) University or junior and technical college-bound students may explore curriculum preferences exclusive of occupational goals, but then relate them to occupational potentials.

(3) A student can conveniently narrow his search for post-high school training institutions which satisfy his curriculum preferences, career goals, and personal preferences.

System evaluation design

IBM plans to field test the system in a secondary school setting. The field test will evaluate how the system affects the level of student educational and vocational maturity, level of occupational and educational information, and self-concept. It will investigate the interaction effects between these criterion variables and certain independent variables such as student age, socioeconomic level, intelligence, and sex. The field test will also provide information on the effects of the system on the activities of the counselor and the frequency, duration, and sequence in which students use the functions of the system.

System functions

The main function of the system is to provide students with information fitted to their individual needs. The system utilizes computer technology to perform this function. A series of data banks, including an occupational information data base, a military data base, a university and junior college curriculum data base, and a college-finder data base, are stored in the computer. For each student, there is also a personalized profile in the computer consisting of (1) a record of the student's grades in the core high-school courses, (2) a gross prediction of his level of educational attainment, (3) a measure of his interest in eight vocational fields, and (4) a rating by the student of his intellectual strengths and weaknesses, and his areas of interest. Under the control of the student, the system will relate his profile to the educational and occupational information in its data banks.

The flexibility of the system allows the counselor to enter the student initially at any one of the system's data banks depending upon his immediate needs and his apparent vocational maturity level. There are linkages by which the student can migrate freely among the data banks.

During an introductory orientation to the system, the student will learn about the vocational development process and how he now fits into it. He will develop an understanding about (1) the relationship between life stages and vocations, (2) the problems of vocational development, and (3) the relationship between educational and occupational ladders. The system will provide him with a flowchart showing the kind of information available in it for the various types of decision-discontinuity points. With the aid of the counselor, he will decide whether he wishes to start with the vocational orientation, the educational orientation, or the post high school educational search.

Access to the vocational information in the system is structured so that the student can browse and explore in order to develop tentative career preferences. The system allows him to describe the kinds of activities, work conditions, and educational aspirations that appeal to him. From a browsing data base, the system retrieves for the student the names and definitions of occupations that are compatible with his preferences. It also alerts him to inconsistencies between his preferences and his profile and introduces him to new occupational alternatives compatible with his profile.

Following the exploration phase, the student can use the system to clarify some of his tentative vocational preferences. He does this by choosing specific occupations for analysis in greater depth. The purpose of the clarification phase is to help the student ascertain whether the values and requirements for that occupation are compatible with his self-concept. The system helps the student compare how he perceives the occupation with how the occupation really is. The topics include: duties performed, training requirements, employment environment, competition, career growth potential, salary, creativity opportunities, degree of difficulty and variety of tasks, and method of entry. The system helps the student become familiar with occupations both through descriptive information and through the presentation of work samples, or games-playing tasks, during which the student is confronted with brief problem-solving situations which simulate those confronting workers in these occupations.

Access to the educational information in the system is also structured so that the student can browse and explore. The system shows the student how his expressed vocational interests relate to each other in terms of both educational level and curricular requirements. If two occupations of interest have different levels of educational requirements, the student learns how to develop a plan that will provide for upward educational mobility, with a transfer of credits if he elects to start his education by training for the lower-level occupation. If the occupations of interest are in different fields, the student learns what kinds of institutions offer training for both occupations so that a dramatic switch of fields after enrollment will result in a minimum cost in dollars and time.

When the student accesses the post high school educational institution data base, the system provides him with work sheets listing educational institutions which satisfy his career objectives and his personal preferences, along with other data such as scholarships, financial aid plans, availability of ROTC, residence facilities, religious affiliations, and all-male, all-female, or co-ed enrollment. The system also provides the student with statements of how well he qualifies for each institution based on his rank in class and/or college entrance examination scores.

The student communicates with the computer system through the medium of a conversational, computer-assisted-instruction type of terminal. Frames of filmstrip information are displayed to the student under computer control. The frames contain multiple-choice questions to which the student responds by using a numeric keyboard. His response is interpreted by the computer which then branches the filmstrip to the next appropriate frame. Detailed, printed reports of the student's interaction with the computer and personalized printed messages for the student are produced by a typewriter printer.

System developmental requirements

IBM engaged in the following activities to develop a computer-based system with the capabilities described above.

First, it identified information-handling needs in today's vocational guidance services and defined a "counseling model" which could help satisfy those needs. This model described: (1) the functions that should be performed to satisfy the needs; (2) the content of the student and educational-occupational information that must be stored in the system; and (3) a set of decision rules which prescribe how, when, and why information is to be entered into the system, processed by the system, and displayed to the system user.

IBM then translated this model into a man-machine system concept. This step included (1) making an optimal allocation of activities in the model between the student, counselor, and machine; (2) defining the taxonomy and logic by which educational and occupational information would be partitioned and made available for retrieval; (3) defining the language and procedures by which the student interacts with the system and moves through the model; and (4) defining information display and entry media for a terminal with which the student could modulate the data-base information and control his progress and location in the mode. As the final step in systems development, IBM performed human-factors studies to test system parameters of language, procedures, information display, and response media.

System developmental progress

The preparing of data files and writing of computer programs for this system was completed during 1968. A one-year period of field testing and evaluation is planned during 1969.

The American Institutes for Research Comprehensive Vocational Guidance System

A computer-managed vocational guidance system is being developed at the American Institutes for Research in the Behavioral Sciences (AIR) under the direction of John C. Flanagan.[1] This systems development project was initiated in April 1968 and is scheduled for completion in March 1970. The project is receiving support under a grant from the U.S. Office of Education, Bureau of Research.

Overview of the system

When the American Institutes of Research staff undertook to develop a computer-based guidance system, they qualified their task in three ways. The first qualification was that their system be within the financial resources of any school district in the country; second, that it be available within a relatively short time; and third, that it maintain the flexibility, insights, and other assets of the counselor.

This guidance system is being developed as an independent part of a fully integrated system of individual education entitled Project PLAN. The emphasis throughout Project PLAN is to provide the student with an educational experience in line with his particular needs, seeking to maximize his potential. An essential step in this process is the introduction of guidance materials relevant to the interests of students as they are maturing. Project PLAN includes several school districts in the Palo Alto area. The comprehensive vocational guidance system will be tried out in these schools.

System objectives

AIR has specified a set of objectives which provide the framework for the development and evaluation of the comprehensive vocational guidance system. These are objectives which all students should achieve completely by the time of their graduation from high school. The guidance programs at each grade level should help students successively approximate the complete achievement of these objectives. These objectives state that each student should:

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[1] John C. Flanagan, American Institutes for Research, P.O. Box 1113, Palo Alto, Calif. 94302.

1. Know and understand his developmental status. This includes knowing and understanding: (a) his personal abilities, interests, values, and other personal characteristics with respect to educational, vocational, social, citizenship, learning, and leisure decisionmaking; (b) that individual differences involve both the inherited traits and learned behaviors resulting from interaction with the environment; (c) the changes in physical and psychological make-up of individuals concomitant with childhood, adolescence, maturity, and aging and the influence of these changes upon personal behavior patterns and learning as these apply to students; and (d) that by controlling his learning activities he can influence the development of his talents and behaviors.

2. Know and understand the conditions and the requirements of the many possible life alternatives in which he might participate. These alternatives include: (a) educational and learning opportunities, (b) vocational opportunities, (c) social and citizenship opportunities, and (d) leisure, cultural, and recreational opportunities.

3. Be able to plan to make decisions wisely. This includes: (a) solving problems in a rational way based on comprehensive data; (b) evaluating the outcomes of plans and subsequent decisions; and (c) making tentative plans that can be altered and making alternative plans that can be substituted in those situations requiring such flexible planning.

4. Be able to integrate information about his developmental status and the requirements of the life alternatives in which he might participate in order to plan, to make decisions wisely, and to manage his own performance in all areas of his development.

System evaluation design

The computer-measurement guidance system will not be made available to all the students in the participating schools in the first year. Thus, it will be possible to compare the extent to which students participating in this program are more effectively informed about career lines than those who do not participate. Although more important evaluations of the system will have to await the results of followup studies that will be carried on beyond the two years planned for the project, preliminary evaluations will be conducted during the second year of the project. The preliminary evaluations will measure shifts in the following four variables: (1) the extent to which the student is adequately informed about the area of work he is planning to enter; (2) the degree of positive affect of the student with respect to his self-concept; (3) the extent of his voluntary efforts to obtain more occupational information; and (4) his understanding of the role which information and probabilities play in decisionmaking.

Systems functions

The following guidance activities will be performed by the system: individual assessment, the provision of educational and vocational information, and individual and group counseling. The system will utilize computer technology to integrate measures of the student's abilities, aptitudes, and interests with guidance materials designed to provide an understanding of work and workers. The system will utilize individual and group counseling to help students become responsible planners and decision makers.

The computer aspects of the system will work as follows. In the computer will be stored: (1) student scores on the Project TALENT test battery; (2) correlations for the original Project TALENT sample between test scores and success and satisfaction in various occupations; and (3) the names of guidance learning units and other materials which will give students a better understanding of work in various fields. The computer will review a student's occupational interests and inform him of his probabilities of becoming a successful, satisfied worker in those areas. It will recommend guidance learning units both for fields in which the student expresses an interest and for fields in which his test scores indicate high probabilities of successful and satisfactory group membership. The Project TALENT study, which provides the data base for the system, includes a probability sample of over 400,000 former high school students who have been followed-up 1 and 5 years after graduation from high school.

The role of the counselor within the system will be further defined as the system is developed. AIR expects that the use of the computer will relieve the guidance worker of the test-processing and information-giving functions which currently place heavy demands on his time and free him to work more directly with students to facilitate increased vocational maturity.

System developmental requirements

Developing the computer capability specified above involves the following tasks: (1) writing the necessary computer programs; (2) identifying and cataloging vocationally relevant guidance-learning units, and (3) developing new guidance-learning units to cover occupations for which suitable units do not now exist. These units will include readings such as career pamphlets, descriptions in the *Occupational Outlook Handbook,* and biographies or other articles related to the world of work. They will also include films and phonograph records to give students realistic pictures of different work areas. Each unit will be designed and tested to insure that it produces the desired learnings in students.

Before the role of the counselor can be developed, a more detailed definition is required. Developing this role involves identifying those counseling techniques most effective in enabling students to become responsible planners and decision-makers.

System developmental progress

AIR plans to complete developmental work by March 1969 and to field test and conduct preliminary system evaluations from April 1969 to March 1970.

The SDC Vocational Counseling System

A computer-based vocational guidance system is being developed by the Systems Development Corporation (SDC) under the direction of Harry Silberman, John F. Cogswell, and Donald P. Estavan.[1] The planning phase of the project was initiated in December 1965. The implementation phase is scheduled to be completed in September 1970. The project is receiving support under a grant from the U.S. Office of Education, Bureau of Research.

Overview of the system

Like other systems, this one is concerned with automating those information-processing guidance functions which machines are capable of performing and, thereby, freeing humans to perform those counseling functions whose successful accomplishment requires an interpersonal relationship. As in the IBM system, one category of guidance functions to be automated by SDC is the provision of vocational and educational information to students. As in the AIR system, another category of guidance functions to be automated by SDC is the derivation of probability statements estimating student success in various occupational fields from followup data on former students. A third category of functions to be automated by SDC includes clerical functions such as the generation of report cards, progress reports, and lists of failing students.

A unique aspect of the SDC system is that it permits the counselor to interact directly with the computer concerning what operation is to be performed, with what data, and for what population. The counselor can do this without possessing computer programing skills because of the development by SDC, under this project, of an English-like computer-user language.

School counselors have been extensively involved in designing and developing the system. Exploratory work on the system was carried out in conjunction with two public schools in Los Angeles, the James Monroe High School and the Sepulveda Junior High School. After receiving training in advanced information-processing technology, the 15 counselors from these schools worked with SDC researchers on the systems design specifications.

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[1] Harry F. Silberman, System Development Corporation, 2500 Colorado Ave., Santa Monica, Calif. 90406.

During the 1-year period planned for system testing, evaluation, and revision, the counselors will be able to specify desired changes in computer programs, user language, and programed interview components of the system. The counselors will be trained in initiating systems change procedures and will be supported by SDC research staff members who will implement the computer programing and language changes resulting from this process.

System objectives

The objective of the SDC system is to facilitate student vocational maturity. By allocating some counseling tasks to the computer and by providing inservice training in group counseling techniques, SDC intends to strengthen the vocational information and humanistic aspects of counseling. SDC feels that a computer-based system for exploring occupational information will require counselors to pool their information and make it more readily available to students. The development of increased skill in group counseling techniques will enable counselors to devote time, freed from information-processing chores, to the formation of growth facilitating interpersonal relationships with students. SDC hypothesizes that an increase in the amount and availability of vocational information and an increase in the amount of time counselors spend listening to students and helping them explore the meaning information has for them will result in increased student vocational maturity.

System evaluation design

The SDC system evaluation design calls for pre- and posttest measures of the following variables: (1) counselor attitudes toward counseling, (2) student attitudes toward counseling, (3) number of school dropouts, (4) allocation of counselor time to counseling activities, and (5) the vocational maturity of students. Measures of counselor and student attitudes toward counseling will be based on the Fishbein AB Scales. Measures of allocation of counselor time will be obtained from time logs kept by the counselors. The Crites Vocational Inventory will be used to assess student vocational maturity.

System functions

The following guidance functions will be incorporated in the SDC system: the provision of educational information, the provision of vocational information, the provision of student program-planning information and individual and group counseling. The system will utilize computer technology to provide educational, vocational, and program planning information. It will also utilize computer technology to support counselors in individual and group counseling by providing them with information on student characteristics and achievement.

The computer aspects of the system will work as follows. Information about the present student population of the field-test school, former students, the world of work, and local and State post high school training institutions will be stored in the computer. For present students, such information as grades, test scores, teacher comments, attendance records, health records, and counselor notes will be included. The information on former students will include grades, aptitude test scores, and followup data. The information on the world of work will describe levels and families of occupations; the information on post high school training institutions will describe kinds of institutions, entrance requirements, fields of study, and scholarship opportunities.

The machine will be programed so that the counselor can instruct it to perform the following functions:

(1) On-line and off-line retrieval of student information.

(2) The generation of lists and reports such as report cards, progress reports, special reports to parents and lists of failing students.

(3) The tracking and monitoring of student progress in school, including failure of students to meet requirements, changes in a student's pattern of achievement, failure of students to take electives that provide a chance for exploration, and other critical situations prespecified by the counselor.

(4) The generation of multiple regression formulas, based on current and followup student data, for use in making predictions about student performance and in conducting research.

(5) The storing of messages to serve as output to the counselor at later, specified times.

The machine will also be programed to conduct three on-line student interviews—a high school program planning interview, a post high school educational planning interview and a vocational planning interview. The educational and vocational interviews will permit students to browse through the relevant computer-data files and will also refer them to outside reading and other sources for greater depth of information. During the high school course planning interview, the computer will query the student concerning difficulties with present courses, choice of courses for subsequent school years and post high school plans. Using the SDC developed PLANIT computer language, the computer will prepare off-line individualized reports advising students on the probable outcomes of their tentative choices. These computer reports will be based on the student's aptitude and achievement scores, grades, and teacher recommendations. At the counselor's request, the computer will provide him with a summary of a student's on-line interview. It will also provide the student with a copy of the interview for him to retain and discuss with his parents.

SDC's purpose in developing programed interviews is to explore some of the systems problems associated with programed interview use in a secondary school setting. Because of the enormous task of developing and maintaining the large-scale information system required to implement a comprehensive set of interview programs, SDC has decided to limit its development of programed interviews to the data bases and functions described above. By including a limited program interview capability in its system, SDC will be able to explore the following system problems:

(1) Is it feasible for counselors untrained in computer programing to develop and modify their own programed interviews, using the PLANIT language?

(2) What are some of the problems for counselors in pooling their knowledge about occupations and education and in making it available to students via the computer?

(3) How can a limited number of terminals for automated interviews be scheduled effectively in large secondary schools?

(4) What should be the interface between the counselor, student, and programed interview?

(5) Can the computer be used to give students purely factual information, saving the counselor many hours of routine interviewing?

(6) How do students react to receiving information from the computer?

(7) What student characteristics—and program characteristics—seem to be associated with positive and negative reactions to computer interaction?

System developmental requirements

The main tasks involved in enabling the computer to perform as specified above are:

(1) The development or adaptation of computer programs for the following purposes: the storage of information in defined data bases, the immediate and delayed retrieval of information from defined data bases, the statistical description (such as frequency counts and means) of subsets of elements in defined data bases, the generation of regression formulas, and the development of three online student interviews, using the PLANIT system.

(2) The development of a special user-language to allow counselors to communicate directly with the computer in English-like statements for the purpose of adapting computer input and output messages to fit their own needs. The counselor will be able to make changes in this user language to simplify frequently used expressions.

Requirements for developing the role of the counselor within the system include training counselors in the use of the computer, the user languages and group counseling techniques.

System developmental progress

Work is underway on the development of the system, and a field test is scheduled for 1969.

The Rochester Career Guidance Project

The Rochester Career Guidance Project was undertaken by the City School District of Rochester and the New York Employment Service with technical assistance from the Eastman Kodak Company. A planning phase was conducted under the direction of Donald H. Johnson during 1967–68. The present phase of the project involves developing and field testing several components of a prototype system. This phase is being directed by David Youst.[1] The project has received financial support from the New York State Employment Service, the Eastman Kodak Company, and the New York State Department of Education.

Overview of the system

The Rochester system is a multimedia support system to improve educational and career exploration and planning. The system includes a computer-based index of career-planning information and an adjunct perceptual resources file in which career-planning information and materials are stored. The fully developed file will include books, periodicals, microfilms, movies, tapes, and slides. These materials will be available for independent use as well as for use within a systems framework.

While a fully developed system will be appropriate for all Rochester secondary school students, the target population for the prototype is eighth-grade students. The system will include a large component of nonverbal materials and, therefore, will have special relevance for the disadvantaged. The system will facilitate role model identification among students by utilizing audiovisual materials showing real people performing a variety of major life roles.

System objectives

The broad objective of the Rochester system is to motivate students to make more effective use of their educational opportunities and to become more adequately prepared for the world of work by actively involving them in career exploration. The system's developers consider that opportunities for educational/vocational career decisionmaking arise early in a student's educational experience with choices of secondary school courses and tracks. They want students to become more actively involved in exploring alternatives within the context of a general career plan. The system provides the student with a framework for career decisionmaking whereby he will be encouraged to (1) put together occupational information and self-knowledge; (2) identify alternative educational/vocational courses of action; and (3) experience the consequences of these alternatives by engaging in vocational planning and decisionmaking activities.

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[1] David B. Youst, City School District, 13 Fitzhugh Street South, Rochester, N.Y. 14614.

More specifically, the system attempts to develop in the student the following understandings and behaviors:

> (1) An increased understanding of work, people, self, and education. This includes: (a) an awareness of occupational and educational opportunities and self-attributes; (b) a knowledge of the terminology used in describing work and education; (c) a knowledge of self-evaluation dimensions relevant to career planning; (d) an awareness of the classifications and categories inherent in the structure of education and work; and (e) an understanding of the trends, demands, and sequences in work and education.
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> (2) Behavior demonstrating increased vocational maturity including increased information-seeking, knowledge of specific occupations, sense of control over individual career development, and growing independence in decisionmaking.

Systems evaluation design

Systems materials will be developed and field tested in a Rochester junior high school. This school was chosen because its student population represents a cross section of the district's school-age population (e.g. 30 percent nonwhite) and because its curriculum and scheduling procedures are more flexible than many traditional schools. Project materials will be housed in one of the school's learning resources centers. The field test will involve 280 students.

The following questions will be explored during evaluation of the prototype materials:

> (1) Are the materials interesting to the students?

(2) Do they have cognitive impact and content validity?

(3) What is the relative effectiveness of slides, movies, and combinations of still and motion sequences on students chosen to represent different ability and socioeconomic levels?

(4) How useful are problem-solving activities in increasing a student's occupational knowledge and vocational decisionmaking skills?

(5) How useful is microfilm as a means of organizing existing occupational and educational materials?

Data for evaluating the materials will be obtained through questionnaires, interviews, and controlled experiments. In evaluating the overall operation of the prototype system, Rochester will specify detailed student behavioral objectives consistent with the vocational readiness and maturation concepts delineated by Gribbons, Super, and Crites.

System functions

The Rochester system will make available three guidance services to student: (1) educational and vocational information, (2) instruction on career-relevant concepts, and (3) training and experience in career exploration. The information function will be carried out both by computer and through the creation of a perceptual resources file. Computer programs will index information according to student attributes (interests, aptitudes, etc.) and occupational variables (salary, demand, physical requirements, etc.). The information itself will be stored mainly in an adjunct perceptual resources file and will include microfilm occupational briefs, audiovisual life career and education studies, and other materials. The occupational briefs will include job descriptions, educational and training requirements, employment information, and sources of additional occupational information. The life career studies will use slides, movie, and audio media to depict workers in various occupations. Each study will describe the worker's job duties, working environment, off-the-job activities, educational, vocational and personal history, and personal aspirations. Three separate studies will be prepared for each occupation, thereby enabling the student to see a variety of people performing a specific occupational roles and to see that different life styles and different preparation routes can be associated with a given occupation. The education studies will depict students in various secondary curriculums and post-high school training programs and describe their academic backgrounds, aspirations, and satisfactions with past decisions.

Teaching-learning units will be created to provide instruction on career-relevant concepts, such as the work environment, and supply and demand. Instruction in career decision-making will be available in the form of games and computer-based simulations which will give students practice in developing plans for attaining educational/vocational goals. The simulations will be designed to prepare students for computer-based course planning during which they will specify educational/vocational goals and work out school curriculum programs consistent with these goals. Toward this end, multi-media high school curriculum descriptions and computer-assisted course planning and registration programs will be developed. These programs will be adaptations of the Palo Alto Unified School District Program for computer-based course selections.

To insure that the system will be effectively utilized in the Rochester school environment, school counselors will be actively involved in the development, evaluation, and modification of system materials. Students will also be involved in the development of materials, especially the life career studies.

System developmental requirements

The following activities will be undertaken to develop a system with the capabilities described above:

(1) The development of occupational, educational, and personal characteristics data bases and the adaptation of computer programs, such as the project's Occu-Search, to index the data bases.

(2) The development of a microfilm file containing most available printed occupational information.

(3) The identification and selection of appropriate hardware.

(4) The development of life career studies, education studies, and teaching-learning units.

(5) The adaption of programs and activities to provide students with experience in educational and career planning, including games, simulations, and computer-based programs for high school course selection.

(6) The determination of procedures for effective utilization of the system in the Rochester Public Schools.

System developmental progress

The Rochester project completed a planning year during 1967–68. The staff is now engaged in developing and evaluating microfilm units and life career studies. Additional development and evaluation of prototype materials is planned for 1969–70 insofar as funds permit. The scheduling of the field test of the fully operating prototype depends on the resources available.

The Pennsylvania State University Computer-Assisted Career Exploration System

The Computer-Assisted Career Exploration (CACE) System is a computer-based guidance system being developed at Pennsylvania State University under the direction of Joseph T. Impellitteri.[1] Work was begun on a prototype model of the system in January 1966 and completed in July 1968. The project received support under a grant from the Pennsylvania Department of Public Instruction.

Overview of the system

CACE is an information system designed for ninth-grade boys interested in pursuing vocational and technical courses in high school. The system provides the boys with on-line access to occupational information stored in a computer and helps them match their attributes with occupational requirements. It is designed to function as an extension of the guidance counselor rather than as a complete, stand-alone guidance system.

The present system, which includes information on 40 occupations, is a prototype of a future, expanded system. The smaller-scale system was developed first in order to test the techniques involved.

System objectives

In developing a system to provide ninth-grade boys with individually tailored occupational information, Pennsylvania State University was attempting to bring about the following cognitive and behavioral changes in these boys:

1. an increase in level of knowledge about specific occupations;
2. an increase in self-initiated occupational exploratory behavior;

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[1] Joseph T. Impelliteri, Department of Vocational Education, Pennsylvania State University, University Park, Pa. 16802.

3. increased ability to articulate and follow a conscious strategy for occupational exploration; and

4. increased exploration of occupations which maximize the individual's abilities and interests.

Systems evaluation design

The system was field tested in two separate trials in the Altoona Pennsylvania School District. The first trial of approximately 10 weeks was held in the spring of 1967 at Keith Junior High School and involved 72 ninth-grade boys. On the basis of this trial, several revisions were made to the system. It was then given a second field trial at Roosevelt Junior High School from October 1967 to May 1968. During the second trial, 140 ninth-grade boys were scheduled to use the machine.

The systems evaluation effort involved: (1) interviewing students to assess their general reaction to the system; (2) developing and administering instruments to assess aspects of student self-knowledge, level of occupational information, and ability to relate individual attributes to occupational opportunities; and (3) measuring changes in student behavior resulting from exposure to the system. Four instruments were developed to assess attitudinal and cognitive changes in students. These are:

(1) The Occupational Values Inventory (OVI) which is based on the categories identified by Gribbons and Lohnes in their longitudinal study of career development.

(2) The Occupational Projections Inventory (OPI) which assesses student estimates of probability of success in various occupations.

(3) The Reaction Inventory (RI) which assesses student opinions regarding various aspects of the system including equipment, content of information, and procedures.

(4) The General Knowledge of Occupations Test which assesses the student's level of knowledge about duties, requirements, working conditions, salary, and employment outlook in those 40 occupations for which the system contains information.

The systems evaluation effort involved an assessment of changes in student behavior in the following areas:

(1) Self-initiated occupational exploratory behavior.

(2) The use of conscious strategies for career exploration.

(3) The choice of senior high school courses of study.

System functions

The main function of the system is to provide occupational information to students. This function is entirely computer-based. In the computer are stored: (1) the program controlling the sequence of system operations; (2) information about student users; and (3) information about 40 selected occupations. The student information includes: (1) a General Aptitude Test Battery (GATB) profile for each user; and (2) a student preference profile including the amount of education desired by the student and his preference for working under various conditions (indoors or outdoors, with people or alone, under supervision or on his own, performing much or little physical activity). The information on each of 40 occupations includes:(1) descriptive information, e.g. duties, entrance requirements, working conditions, salary, advancement opportunities, and employment outlook; (2) a rating of each occupation in terms of the GATB profile items; and (3) a rating of each occupation in terms of the preference profile items. The 40 occupations selected are mainly trade or technical occupations which do not require more than 3 years of education beyond high school.

When the student first uses the system, he is given an orientation to its purposes, and a list of the 40 occupations with their corresponding codes. The computer then asks the student to indicate which occupations he would like to know more about. The student enters the occupational code number and the compter types out a short paragraph describing the occupation. The student may then request more detailed informaion about the occupation. If so, four operations are activated in the following order:

(1) Discrepancies which may exist between the student's ability—preference profile and the requirements of the occupation are typed out.

(2) A 2-minute taped interview with a worker in the occupation is played.

(3) A slide is projected depicting the worker undertaking four typical occupational tasks.

(4) A 150- to 200-word description of the occupation is typed for the student to read, and to retain for later use.

The student is allowed to proceed through as many occupations as he wishes during as many 40-minute sessions as he wishes. He may, at any point in the process, indicate that he would like the computer to select occupations for his further exploration. The computer, by comparing the aptitude-preference profile for the student with the 40 occupational profiles, selects those occupations for which no discrepancies exist.

The terminal through which the student interacts with the system is composed of a typewriter-like device, a tape recorder, and a slide projector, all under computer control. The computer relates selected materials to the student by typing out a message, or activating a slide or tape. The student relates messages to the computer by typing short responses on the typewriter.

System development requirements

Four main activities were involved in developing the prototype. These were:

(1) The development of computer programs to control the sequence of operations.

(2) The development of 2-minute taped interviews from workers in each of the selected occupations.

(3) The development of slides picturing the worker performing typical tasks in his work environment.

(4) The development of occupational descriptions at a seventh-grade reading level for each of the occupations selected.

System developmental progress

The field test of the prototype was completed in July 1968. In a final report, the investigators concluded that the prototype system has met some, but not all, of its objectives. On the positive side, boys who were exposed to the system considered it useful and demonstrated an increased level of knowledge about selected occupations. On the negative side, the system was not successful in encouraging boys to explore unfamiliar occupations or in helping them formulate and follow conscious strategies in exploring occupations.

Plans are now underway at Pennsylvania State University to reconceptualize some of the main issues in applying computer technology to guidance. The project staff intends that future developmental efforts on this system will encompass a theoretical foundation in vocational psychology as well as a problem orientation. In that way, they hope to make the system more effective in helping individuals integrate vocational information into a usable framework. A field test of a vastly revised version of the system is planned for the winter of 1969.

The University of Oregon GUIDPAK System

Guidpak is an entry-job vocational guidance system being developed at the University of Oregon under the direction of John W. Loughary[1] and Murray Tondow. Work was begun in October 1967 and is scheduled to be completed in June 1969. The project is receiving support from the Instructional Systems Corporation.

Overview of the system

This system is designed to help counselors provide entry-job information to students who have taken neither college preparatory nor specific vocational work in high school. The system motivates students to actively explore entry-level job opportunities by involving them in the compilation of job data. It includes student materials for use in evaluating job opportunities and counselor materials for use in supervising students. Although the system is not computer-based or managed, it will include optional computer programs for storing and retrieving the occupational information which it generates.

System objectives

The general objective of the system is to help students acquire entry jobs which maximize their career development potential. The system conceives of high quality entry jobs as jobs which provide the begining worker with: (1) opportunities for identifying possible ensuing jobs; (2) opportunities for preparing for these ensuing jobs; and (3) much flexibility for revising career development stategy.

More specifically, the system attempts to develop in the student an ability to evaluate entry-level jobs in terms of his attributes, the potential job benefits, and the time required on the job to actualize these benefits. The system helps the individual evaluate himself along these following job-related dimensions:

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[1] John W. Loughary, Department of Education, University of Oregon, Eugene, Oreg. 97403.

(1) *Aspiration*—the occupational, social, and economic status to which the student currently aspires.

(2) *Motivation*—the stated willingness of the student to achieve his aspirations, i.e. the amount of time and priority he is willing to assign to occupational development.

(3) *Achievement*—the salable occupational skills which he currently possesses.

(4) *Interests*—includes both broadness and depth.

(5) *Abilities*—the intellectual and personal-relation capacities which he currently possesses.

The system helps the individual evaluate an entry-level job's potential along these dimensions:

(1) Generic base— the similarities in regard to tasks and environments between this job and other jobs in the larger work environment.

(2) Job family—where the job falls within the more traditional and empirical occupational hierarchies.

(3) On-the-job-training—the formal and informal opportunities for developing skills and competencies which the job provides.

(4) General exposure—the extent to which the job enables the worker, via his job responsibilities, to be exposed to other people and other jobs in other environments and to play different roles with these other workers.

(5) Employer philosophy and policy—the ways in which the employer views entry-job workers, the responsibilities he accepts for them, and the manner in which he carries these out with employees.

(6) Earnings—the amount of financial remuneration that the job provides.

(7) Expenses—the cost to the employee entailed in holding the job.

System functions

The system provides two main guidance services to students: information about entry level job opportunities, and procedures and tools for use in evaluating these jobs.

The system will contain the following: (1) materials that structure student exploration of entry-level jobs; (2) materials that enable the counselor to keep track of student experiences within the system; (3) multimedia resource career development materials; and (4) data detailing local entry job and training opportunities and the training and work experiences of recent graduates. The student materials assist students to appraise individual attributes, identify entry job alternatives, map out strategies, and keep track of their activities within the system. The counselor materials help the counselor manage the many activities and the large amounts of information involved in individualizing entry-level job guidance services. The multimedia resource materials include various educational and vocational informational media, such as films, recordings, charts, and booklets. GUIDPAK will supply some of these materials and will also make it possible for schools to integrate their own guidance materials into the system. The experience data describe employment opportunities, employer characteristics, and the local job and vocational school experiences of recent graduates. GUIDPAK does not provide these data but does contain procedures and materials whereby schools may collect and maintain the data. The system's developers expect that collection and maintenance of such data will probably be computer-based in larger schools and performed manually in smaller ones.

System developmental requirements

Subsystems are being developed for each of the following functions:

- Pupil needs analysis and strategy development.
- Conceptualizations of general career goals.
- Interview training.
- Strategy revision.
- Individualized study.
- Local entry-job information collection, storage, and retrieval.
- Obtaining a job.

Examples of the kinds of materials required in developing a subsystem are given below for the subsystem on local job entry information. This subsystem requires student participation in all phases and aspects from initial planning to maintaining information files. Whenever possible, the procedures for operating the subsystem are counselor independent. This subsystem includes:

- Materials for use by school systems in planning the information collection process, including master planning sheets and counselors' manuals.

- Materials for identifying and organizing student participation, including a scheme for recording the division of labor, guidelines for the construction of teams, computerized student name lists and rosters, a student handbook, and a team leader manual.
- Materials for organizing an Employer Advisory Council, including form letters of invitation, coordination procedures, and meeting guides.
- Materials for use in fostering community relations, including formats for press releases and mail-out forms for volunteer employer participants.
- Graphs for plotting the student duties involved in information collection.
- Instruction sheets for identifying entry job employers and forms for listing their names.
- Materials for training student interviewers, such as training guidelines, audiovisual materials, and interview simulation games.
- Form sheets for recording interview appointment information.
- A schedule board and tabs for keeping track of interviews.
- Materials for use in conducting interviews including student handbooks, data collection forms, job lists, and dress charts.
- Followup letter forms thanking employers for interviews.
- Materials for use in editing and classifying interview information, including an occupation index, editing instructions, and indexing instruction.
- Computer programs and card formats for use in preparing information files.
- Forms for recording the names of students who have interviewed firms.
- A schedule chart for use in constructing a master schedule of employment interviews.
- Forms for recording student comments about the effectiveness of the subsystem.
- Forms for conducting student followup surveys and procedures for revising interview information annually.

System developmental progress

The Local Entry Job Information Collection, Storage, and Retrieval Subsystem of GUIDPAK is nearly completed, and field testing is scheduled to begin shortly. For the total system, the following planning and designing activities have been completed: (1) reexamination of the entry-job concept, and identification of its components, (2) identification of the personal and environmental conditions which must be considered, and (3) development of a guidance process model. The tasks remaining are to build the complete operating system and to test it.

The Willowbrook Computerized Vocational Information System

A vocational guidance system is being developed for Willowbrook High School, a large, comprehensive high school outside of Chicago. Jo Ann Harris,[1] Director of Guidance, is the project director. Work was begun in 1967 and is scheduled for completion in 1971. The project is receiving support under a grant from the Research Coordinating Unit of the Illinois Board of Vocational Education and Rehabilitation.

Overview of the system

Like some other systems described above, the Willowbrook system uses computer technology mainly to make individualized vocational information more readily available to students and counselors. The system's computer serves as an automated library for vocational and student cumulative-record information. Students will have on-line access to the vocational information in the system. Counselors will have on-line access to the vocational and student information and will also receive off-line reports of student interaction with the computer.

System objectives

The Willowbrook guidance staff expects that student use of the system will facilitate the following changes in student behavior:

(1) Because vocational information will be more readily available, students will engage in increased vocational exploration.

(2) Because information will be more effectively tailored to an individual's attributes, students will become aware of discrepancies between stated goals and measured attributes and will be more likely to choose alternatives which maximize their chances of success and satisfaction.

(3) Because the system will inform students about occu-

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[1] Jo Ann Harris, Willowbrook High School, 1250 South Ardmore Ave., Villa Park, Ill. 60181.

pational requirements, students will make immediate program choices which are congruent with their long-range occupational goals.

Systems evaluation design

Willowbrook has not yet worked out a detailed evaluation design and intends to hire consultants for that purpose. The project staff has, however, made a tentative identification of the kinds of data to be collected:

(1) Student shifts in educational goal levels and occupational interest areas.

(2) The number of times the computer identifies discrepancies between a student's goals and his measured attributes and achievements.

(3) The effects of these discrepancy measures on students; for example, do they cause students to move toward more realistic goals?

(4) The last 10 occupations explored in depth by each student. This will be compared with results of 1– and 5–year followup studies to see to what degree the system refers students to occupations which they later choose.

(5) The number of times each occupation is explored by a student.

(6) The number of times each student uses the systems.

Willowbrook also intends to administer questionnaires and conduct interviews, control group studies, and long-term followup studies for purposes of system evaluation.

System functions

The main function of the system is to provide individualized vocational information to students. Information on 650 occupations, classified according to a system developed by Dr. Anne Roe, will be stored in the computer. The Roe classification system divides occupations into two dimensions—level of work and area of interest. The level dimension includes six categories and is based on amount of training required and the degree of responsibility assumed by the worker. The interest dimension includes the following eight categories: (1) service, (2) business contact, (3) organization, (4) technology, (5) outdoor, (6) science, (7) general cultural, and (8) arts and entertainment.

Initially, the following student information will be stored in the computer: cumulative class rank, composite score on an aptitude and achievement test battery, and scores on the Kuder Preference Record. After the system has been operating for a few years, other items from the student cumulative record, such as grades in specific courses and personality ratings, may also be stored.

The computer will compare individual student attributes with occupational requirements by relating the student's rank in class and composite test battery score to the six Roe level categories and by relating his Kuder scores to the eight Roe interest categories.

Before using the computer, students will be given group instruction in the classification system. Sophomores, juniors, and seniors will then be invited to use the computer system on a voluntary basis during their free time. The computer terminal will include a cathode ray tube which will permit multiple-choice responses by students, and an automatic typewriter for the presentation of individualized computer messages to the student.

Student access to the occupational data will be structured in the following way. Students will be asked to rate themselves in terms of learning ability, cumulative class rank, interest areas and post-high school educational plans. The computer will compare the student's self-rating with the information in its data file and inform him of discrepancies. It will help him identify interest categories and training levels for exploration. If the student wants to explore training levels which the computer considers unrealistic in light of his present record, it will give the student a major discrepancy message. This message will ask the student to exit from the system and work out the discrepancy with his counselor.

Once the student has indicated an interest category and a training level, the computer will print out the occupations meeting these specifications. The student may either explore these occupations or indicate different education and interest categories and, thereby, obtain a second list of occupations.

If a student asks to explore a particular occupation, the computer will provide him with a 50-word definition via the cathode ray screen. If he requests more detailed information, he will receive a 250- to 300-word, typed description covering job duties, training requirements, recommended high school courses, working conditions, beginning salary range, and employment outlook. The computer will also refer the student to noncomputer based materials containing additional information about that accupation.

Willowbrook plans to add the following vocational planning data to the computer-data banks during the system's second operating year: (1) information on trade, technical, and apprenticeship programs in the Chicago area; (2) information on colleges, including sources of scholarship aid; (3) general information on choosing a first job; and (4) placement information for DuPage County.

Each counselor will have a cathode ray tube terminal in his office whereby he can retrieve vocational information, student cumulative record information, and information about his counselees' interaction with the system. The computer will print out daily, for the counselors, a list of counselees who have received major and minor discrepancy messages on the system during that day.

System development requirements include the writing of computer programs and the preparation of data files.

System development progress

Willowbrook plans to have a first generation model of the system containing the student and vocational data described above in operation by mid-1969. The second phase of development, including data bases containing post high school education, training, and job placement information, is scheduled for completion in October 1969.

The Palo Alto Computer-Based Course Selection and Counseling System*

A computer-based course selection and counseling system is being developed by the Palo Alto Unified School District under the direction of Dr. Murray Tondow and Dr. Mary L. Betts.[1] Work on the project from 1966 to 1968 was made possible by a U.S. Office of Education grant under title III of the Elementary and Secondary Education Act.

System objectives

The Palo Alto Unified School District became involved in computer-based counseling because of a set of objectives defined by its Guidance Department some years ago. In the course of a year-long study of these guidance aims and functions (under a grant from the National Defense Education Act), counselors defined their primary role and objectives as that of helping students to make good decisions. "Good decisions" were defined as decisions based on a knowledge of the alternatives and an understanding of the personal implications of each alternative. Students are constantly faced with the need to make decisions as they move through the school system, and these decisions affect both their current experiences and their future options.

Good decisions, then, require relevant information. Systems work turned up two sets of facts which formed the basis for the objectives of the computer-based counseling project. First, a study of the decisions students must make revealed that relevant information was not always available when and where it was needed. Second, counselors were spending a large percentage of their counseling hours dispensing basic information about colleges, careers, and high school courses. The breakdown was particularly severe at the ninth to 10th grade transition which requires junior and senior high school faculties and programs, and which confronts the student with a wider range of choices (with profound implications for his future) than he has previously faced.

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*This description was prepared by the project staff at the Palo Alto Unified School District.

[1] Murray Tondow, Educational Data Services, Palo Alto Unified School District, 25 Churchill Ave., Palo Alto, Calif. 94306.

Accordingly, the ninth grade was chosen as the level for the initial phases of the project. The overall objectives were to investigate how the computer could help—

- To provide students with more information than they currently received in order to facilitate better decisions.
- To relieve the counselor of the task of dispensing basic information about colleges, jobs, and high school courses and to relieve him of as much of the paperwork related to scheduling as possible.
- To provide counselors with more time to spend in interpretation of information about the individual student; to advance the level at which student-counselor dialogs take place by providing the student with certain types of information before seeing his counselor.

To work toward the achievement of these objectives, two immediate questions had to be answered. These questions formed the objectives of the first two phases of project research and development:

1. Could computing facilities within the range of a school budget accomplish the tasks outlined above?
2. What is the psychological impact on the student of guidance-related information dispensed by the computer and how does the interaction between student and computer enhance or degrade the total counseling function?

System functions

The computer-based program now consists of a "dialog" between the student and the computer, via remote access terminals in the school. (For a full description of the dialog and project, see *Journal of Educational Data Processing,* Vol. 4, No. 4, fall 1967.) The dialog gives the student information, in the form of experience tables, about successes of past ninth-graders in his school; data are given on college entrance and success, on entry jobs, and on courses in 10th, 11th, and 12th grades. The student is advised of his high school course requirements and may select a tentative course program for the 10th grade. His selections, together with his current courses and grades and any problems he says he has with his courses, are sent to his counselor within 24 hours of his dialog participation. The student may also request an appointment with the counselor via the dialog.

The current dialog is not complete. The project's early concerns involved assessment of programing problems and computer requirements, and assessment of student reactions, for which this dialog was sufficient. The expansion of the dialog into a larger informational and management system is now underway. Functionally, the project operates from the premise that the computer's strengths lie in its ability to contain and organize large amounts of information for quick update and retrieval and to manage certain school operations, using its data. The functions or roles of interpretation of information, assisting with decisions involving values, and helping to solve personal and social problems are left to the counselor, who can do these things best. It is the function of the computer, in this system, to give the counselor more time to work in these most important areas.

College and job information, vastly expanded over the current dialog's content, can be made available to students via computer. So can more detailed information on high school courses. Information on students (current schedules, grades, test scores, now kept in the computing center for data-processing purposes) can be made available to counselors via terminals. The dialog may be expanded to include a section which would help students discover what kind of information, and at what level of specificity, they are ready for and then guide them to that information. A working committee of interested counselors is currently evaluating the results of the second year's run; their plans include the possibility of preparing a number of presentations on specific topics of interest for counselors to use with small groups. These presentations, school resources such as the VIEW[2] project materials on vocations, college films, and the computerized college and job information bank, would form the resources set to which the computer could direct the student after helping him to decide, for example, that he wants to see a film on campus life at Berkeley rather than a list of entrance requirements, when he asks for "information about Berkeley." The computer could keep track of students with similar interests and could notify the counselor whenever there were sufficient requests for a particular group session.

System evaluation design

Much of the planning described above results from evaluations of the first two years' use of the dialog. The first year's run, with 90 volunteer students at various ability levels, dem-

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[2] Vocational Information for Education and Work; project sponsored by Title III, National Defense Education Act, and begun in San Diego, Calif.

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System evaluation design

Much of the planning described above results from evaluations of the first two years' use of the dialog. The first year's run, with 90 volunteer students at various ability levels, demonstrated students' interest in the dialog and its suitability to a wide range of ability levels. (Detailed results are given in the article in the *Journal of Educational Data Processing* cited above.) Briefly, students were interviewed (and tape recorded) immediately after the dialog and sent a quiz and a questionnaire some weeks later. Computer feasibility was demonstrated, and questions about the psychological impact of the computerized nature of the dialog were answered satisfactorily. Students find the impersonality a relief and trust that the computer has no biases. They are pleased at having control over the flow of information and like being able to request an appointment with the counselor by so simple a method.

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[2] Vocational Information for Education and Work; project sponsored by Title III, National Defense Education Act, and begun in San Diego, Calif.

Questionnaires in the second year's run (using the entire ninth grade in one school) revealed the wide range of readiness for and desire for information about courses, colleges, and jobs. This finding is responsible for current planning toward a management system to make various kinds of information more or less constantly available. A second finding, again from questionnaires and from counselor interviews, is that ninth graders feel pressure to obtain and want to obtain much more information and more specific information about colleges, courses, and careers, than was predicted. Counselors kept detailed record sheets of all interviews with ninth graders; analysis of these records (currently being done) will give some idea of whether the dialog has changed the patterns of student-counselor interaction. Similar questionnaires, record sheets, interviews, and systematic study of the use of the system will be applied to future work.

System development requirements

One of the project's characteristics to date has been the degree to which it has utilized existing materials. In the current dialog, all data on past students, records of current students, and course requirements existed before the dialog. Guidance department followup studies, regularly done, provided data on colleges and entry jobs; data-processing master files provided data on past and current students' courses and grades. Course requirements were similarly available. The development of accurate experience tables, the modeling of the dialog's tone and language, the systems work required to integrate various data into a whole, and the extensive programing and computer work all had to be accomplished within the project.

In order to expand the scope of the project, any or several sets of data or materials will be required:

1. Information on the colleges and entry jobs relevant to

Palo Alto students. Some 200 colleges account for about 95 percent of Palo Alto's college-bound students (approximately 90 percent of the students go on to further education), so the development of a detailed information set about these colleges is feasible. Locally available entry jobs are similarly limited to a manageable set. District followup studies and nationally available data will provide information related to campus life, academic and social emphases, and predominant majors, as well as costs, locations, and the like for the colleges. For jobs, the responses from vocational followup questionnaires, personality, and preference data are available.

2. Small group presentations on the various areas or topics students want covered will have to be developed if they do not now exist (much material is already available).

3. If a management system utilizing student input is to be added, it will have to be developed and programed.

System development progress

The dialog exists and has been tested over 2 years. Extensive data from these 2 years' experience are available and have been processed. A working committee of counselors has met for the last year to determine what the significant findings are, what expansions or additions to the dialog need to be made, and how the computer is to be fitted into the total guidance program. Work on college, job, and course information systems is in progress. The working committee and project staff will continue to meet to decide the exact scope and nature of the possible additions listed above and to set priorities for the use of available resources in expanding and testing the system. These decisions and testing out of various forms of additions will consume the academic year 1968–69; if results prove desirable and resources permit, a version of the expanded system should be available for use in the spring of 1970.

The Bartlesville Total Guidance Information Support System

A computer-assisted counseling system for the Bartlesville Public Schools is being planned by Oklahoma State University under the direction of Tommy L. Roberts and Edward Forsberg.[1] Design work was started in February 1968, to be completed by February 1969. The design phase has been supported under a U.S. Office of Education grant under title III of the Elementary and Secondary Education Act. A development phase is planned for 1969–71.

Overview of the system

The Bartlesville Total Guidance Information Support System (TGISS) is concerned with facilitating improved student decisionmaking by utilizing computer technology to provide the counselor with information relevant to the following student decisions: (1) Academic course selection, (2) vocational course selection, (3) learning commitment, (4) extracurricular activities, (5) noncurricular activities, (6) continuation of school, (7) college selection, (8) job selection, (9) military obligations, and (10) marriage.

System design requirements

The following steps are planned in designing the vocation subset of this system:

(1) The determination of a vocational development framework within which the system will operate.

(2) The identification of types of information required by students in decisionmaking.

(3) The delineation of the role of the counselor in facilitating decisionmaking.

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[1] Tommy L. Roberts, College of Humanities and Sciences, Southern Methodist University, Dallas, Tex. 75222.

(4) The specification of system data bases and ways in which counselor access to the data will be made possible.

System design progress

A feasibility study has been completed, and initial planning work is underway.

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